CHAMELEON RETAIL

ENVIRONMENT RESPONSIVE RETAIL IN THE EMERGING MARKET

Declaration:

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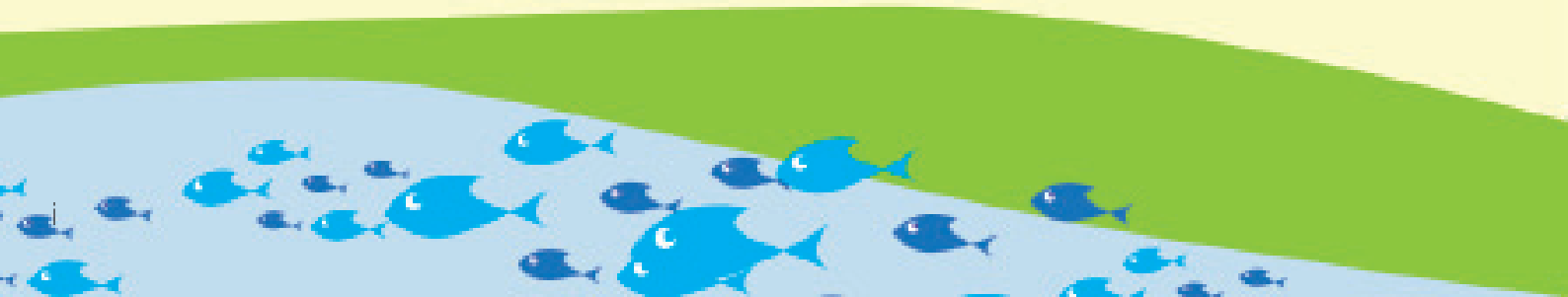

Acknowledgements

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Abstract

Commercial development within the emerging economy needs to simulate, adapt and respond accordingly to its unique environment. By doing so, a mutually beneficial relationship between the different scales of commerce, the community and their host environment is achieved. This thesis will focus on the retail aspect of what is later defined as the vibrant economic node. It will identify the current issues that exist within the community's retail mode, thereafter, examining the various commercial proposals in similar types of communities. By investigating the area of a proposed development and establishing the status quo and providing the development with information of the brief for the project, this will, in turn, lead to a proposed solution that is more beneficial to the community.

Investigations into cost effective and appropriate technologies that not only benefit the development but also provide an alternative solution to the community's needs are investigated.

A design proposal that embodies the ideals of what is defined as an environmental responsive commercial development, is brought forward as a demonstration of how a particular element within a framework can be beneficial

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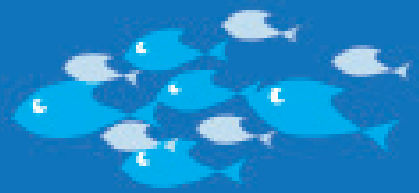
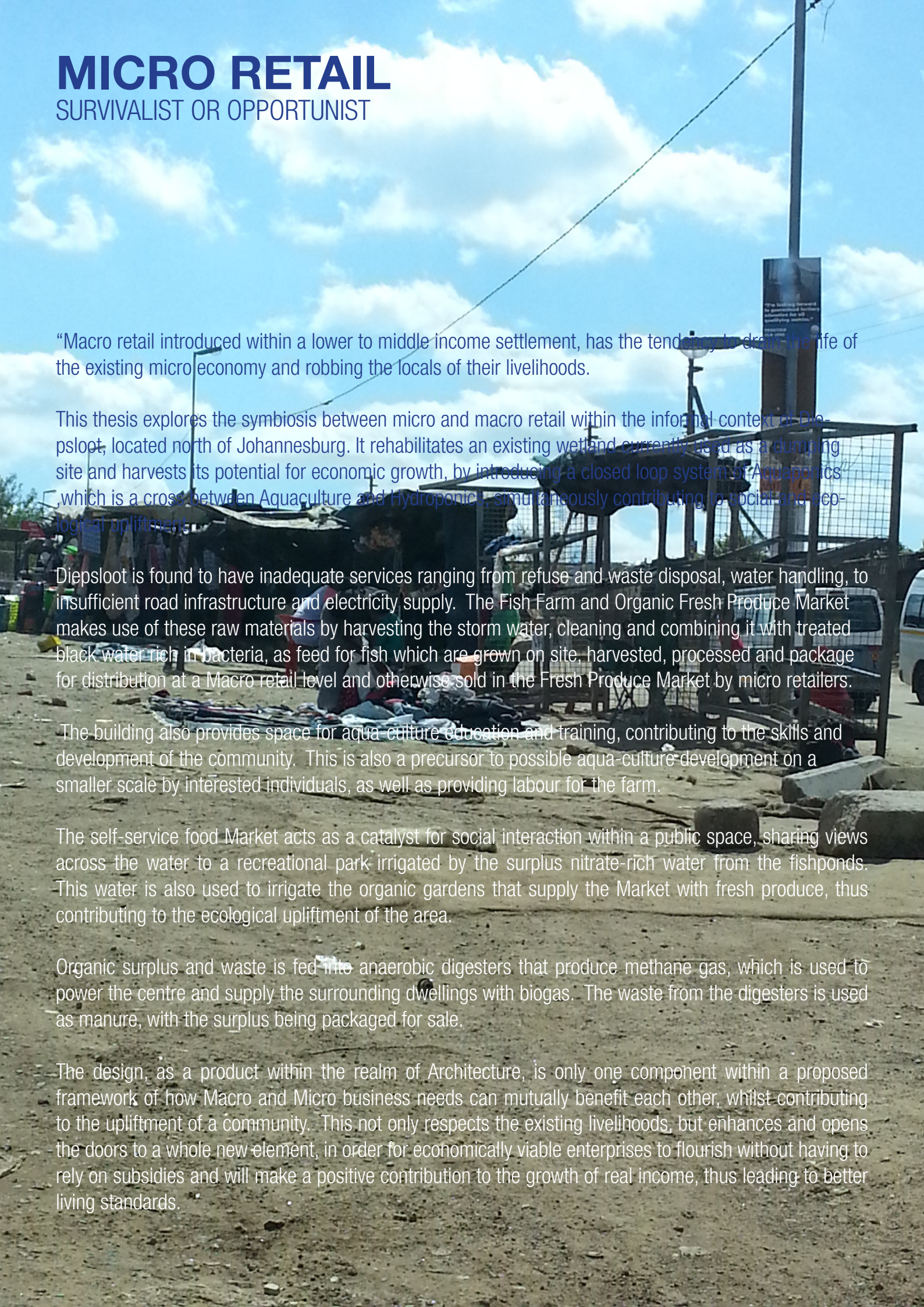
Image details and other information



MICRO RETAIL

SURVIVALIST OR OPPORTUNIST



"Macro retail introduced within a lower to middle income settlement, has the tendency to drain the life of the existing micro economy and robbing the locals of their livelihoods.

This thesis explores the symbiosis between micro and macro retail within the informal context of Diepsloot, located north of Johannesburg. It rehabilitates an existing wetland currently used as a dumping site and harvests its potential for economic growth, by introducing a closed loop system of Aquaponics ,which is a cross between Aquaculture and Hydroponics, simultaneously contributing to social and ecological upliftment.

Diepsloot is found to have inadequate services ranging from refuse and waste disposal, water handling, to insufficient road infrastructure and electricity supply. The Fish Farm and Organic Fresh Produce Market makes use of these raw materials by harvesting the storm water, cleaning and combining it with treated black water rich in bacteria, as feed for fish which are grown on site, harvested, processed and package for distribution at a Macro retail level and otherwise sold in the Fresh Produce Market by micro retailers.

The building also provides space for aqua-culture education and training, contributing to the skills and development of the community. This is also a precursor to possible aqua-culture development on a smaller scale by interested individuals, as well as providing labour for the farm.

The self-service food Market acts as a catalyst for social interaction within a public space, sharing views across the water to a recreational park irrigated by the surplus nitrate-rich water from the fishponds. This water is also used to irrigate the organic gardens that supply the Market with fresh produce, thus contributing to the ecological upliftment of the area.

Organic surplus and waste is fed into anaerobic digesters that produce methane gas, which is used to power the centre and supply the surrounding dwellings with biogas. The waste from the digesters is used as manure, with the surplus being packaged for sale.

The design, as a product within the realm of Architecture, is only one component within a proposed framework of how Macro and Micro business needs can mutually benefit each other, whilst contributing to the upliftment of a community. This not only respects the existing livelihoods, but enhances and opens the doors to a whole new element, in order for economically viable enterprises to flourish without having to rely on subsidies and will make a positive contribution to the growth of real income, thus leading to better living standards.

1. Introduction

2. The Vibrant Economic Node

3. Retail Typologies; Informal Versus Commercial: Case studies

4. Effects of Commercial Development in Townships

5. Informal Settlement: - the New Hybrid Typology

CHAPTER 01

Introduction

The broad idea of this thesis is to create a vibrant economic node within an emerging economy, in an effort to improve its economic landscape. The main characteristics of such a node will be brought to light with the key economic-based driving factors examined closely in case studies. The aim will be to identify the weaknesses of other developments and the goal will be to propose a more successful typology, better suiting the needs of the community, their environment and economy.

The Vibrant Economic Node (VEN)

The vibrant economic node within an emerging economy is recommended to be the mixed use in nature as it offers the following:

- a concentrated and diverse range of goods and services
- represents concentrations of both Private and Public sector investment
- establishes the image of the area
- forms important sources of revenue for local Governments
- generates significant employment opportunities
- hosts enormous economic diversity.

Developing such nodes in the emerging economy can result in the urban system being restructured in such a way that "integration takes place in a spatial as well as an economic context." (Demacon2010)

Over the past few years, nodal development has shifted from social to a more economic approach. (Demacon, 2010). The economic logic of a mixed-use node assumes that the bigger the market share, the shorter the distance to the node and thus a more attractive the location. (Demacon, 2010) Development of these nodes is based on "desire lines, representing a naturally expressive pattern of consumer movement preferences - with the emphasis on pedestrian and

The use of the mixed use node type of development in the broader sense in this thesis is aimed at creating a node that improves the social and economic conditions of the community, thereby creating an entity consisting of a hybrid of economic and social activities that are vibrant and pedestrian friendly, with the main structuring elements being; public spaces, connections, public sector facilities and private enterprises within a contextual development system.

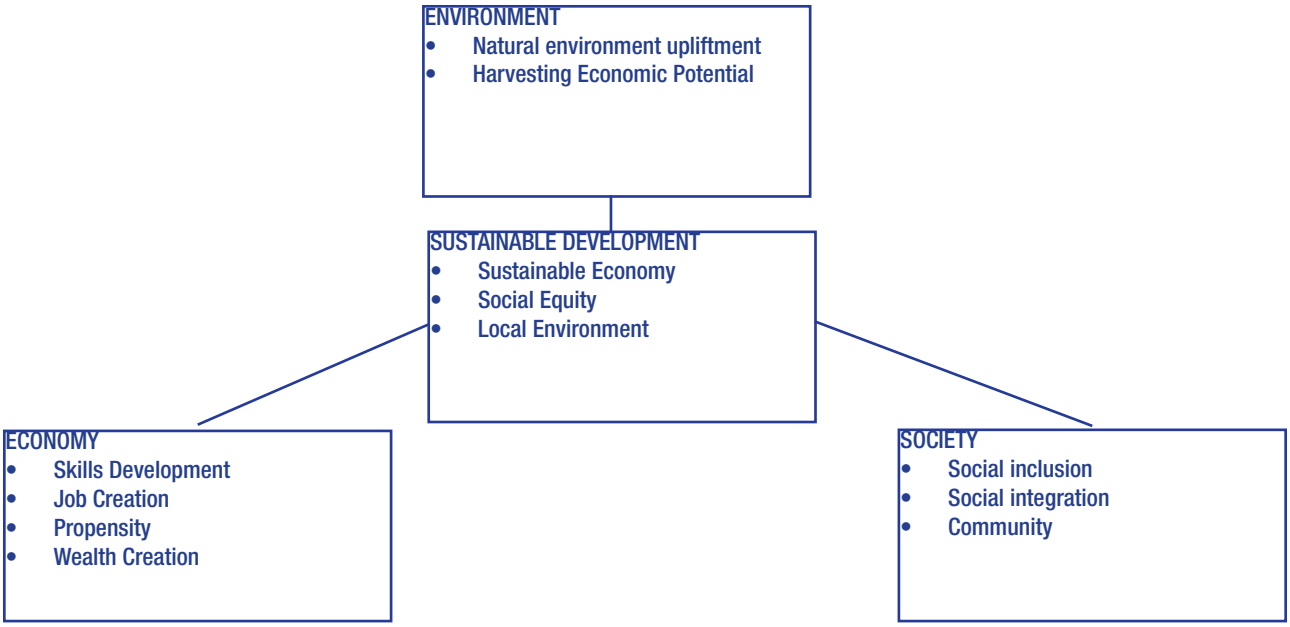


Diagram 1:Sustainable development
Source: Diagram by Author

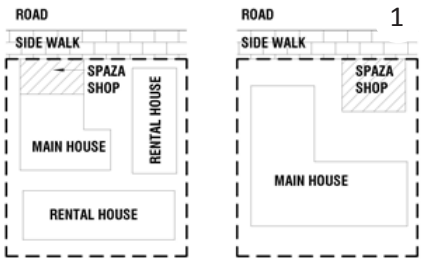
This is illustrated in diagram 1 as a consideration of environmental, societal and economic aspects of a community, which in itself defines it as sustainable development.

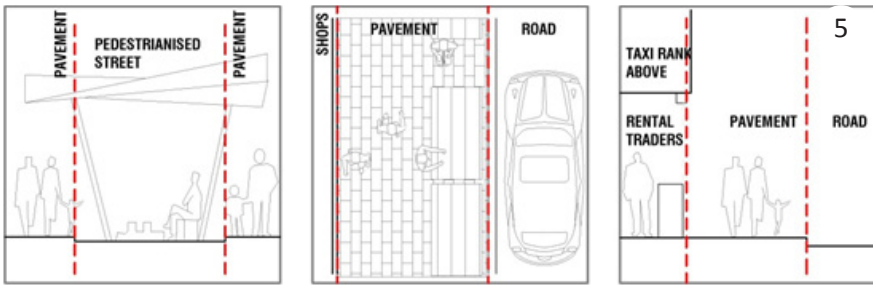
These building blocks are translated into various urban property markets, essentially anchors within the node that include residential markets, retail markets, office markets, light industrial markets and community facilities. These anchors can be configured as a retail centre; community facilities such as municipal offices offering services such as pension pay points; rates hall and others; integrated residential uses and clinics, as well as a community library. Human scale is to be prioritised with emphasis on the needs of pedestrians, encouraging permeability within the urban structure .The main focus is to be on entrepreneurial development and market response.

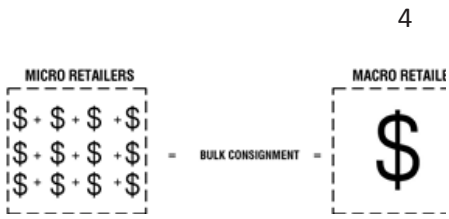
The development is to be phased with the key influencing drivers that are likely to generate the critical mass of customers, which will in turn, result in the success of the development and catalyse further investment into the next phases of expansion within the node. This will form the focus point of this thesis. The first phase will essentially aim to tackle

The pressing social, environmental and economic needs, fundamentally responding to the local trade and industry dynamics and setting a precedent for future phases.

The following section will examine the existing retail industry on both a Micro and Macro retail level, in order to establish the nature that this retail development should take on .







1. Typical plan for a Spaza shop, illustration by Author
2. Tailor`s kiosk, image by Author
3. Gold exchange kiosk, image by Author
4. Aquisition model, Diagram by Author
5. Hawker typologies, Illustration by Author

Macro vs Micro*

South Africa offers the most modern and industrialised economic base, however, its formal sector is unable to absorb the influx of candidates into the labour market annually. As such, these candidates resort to the informal enterprise which can be perceived as an erratic, transitory means of survival amongst the poorest of citizens or an opportunity to generate a sustainable livelihood (Rolfe 2010).

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One of the common forms of informal trade are spaza shops; they are typically family establishments in which members are involved in the retail of products usually your day to day consumables such as vegetables, fruit and beverages. These as illustrated in Fig 1 are part of a residential property and are either part of the house or within the site boundary but away from the house.

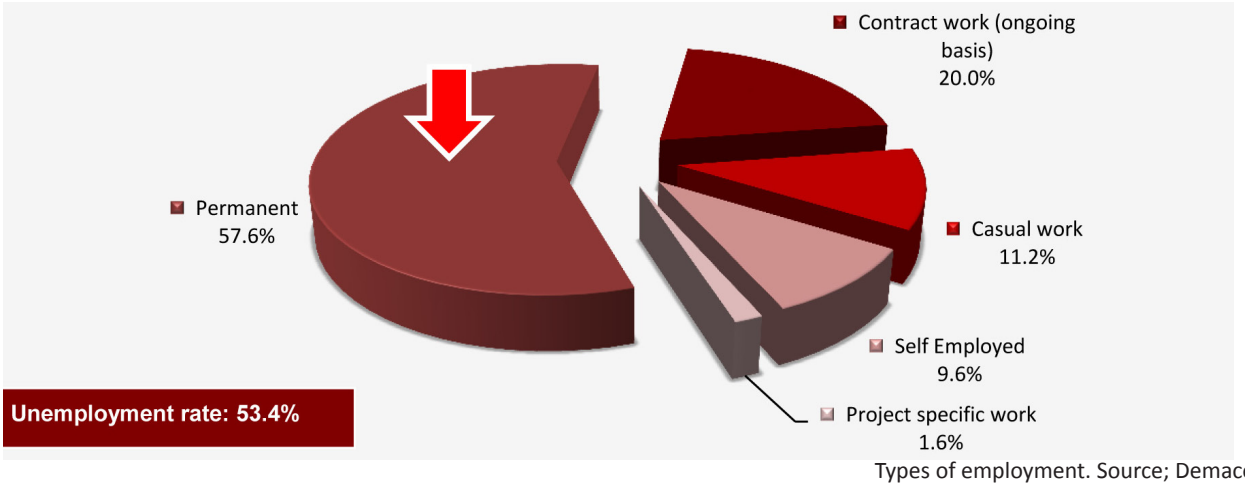
Micro retailers, who run their businesses off-site of their residents by a more strategically chosen location, are referred as tuck-shops or kiosks.

A local businessman who operates a bulk wholesale business in Germiston , Antonius Youssef, gives an account of how these micro retailers are able to afford bulk goods at the same rate at which he sells to established medium to large business enterprises.

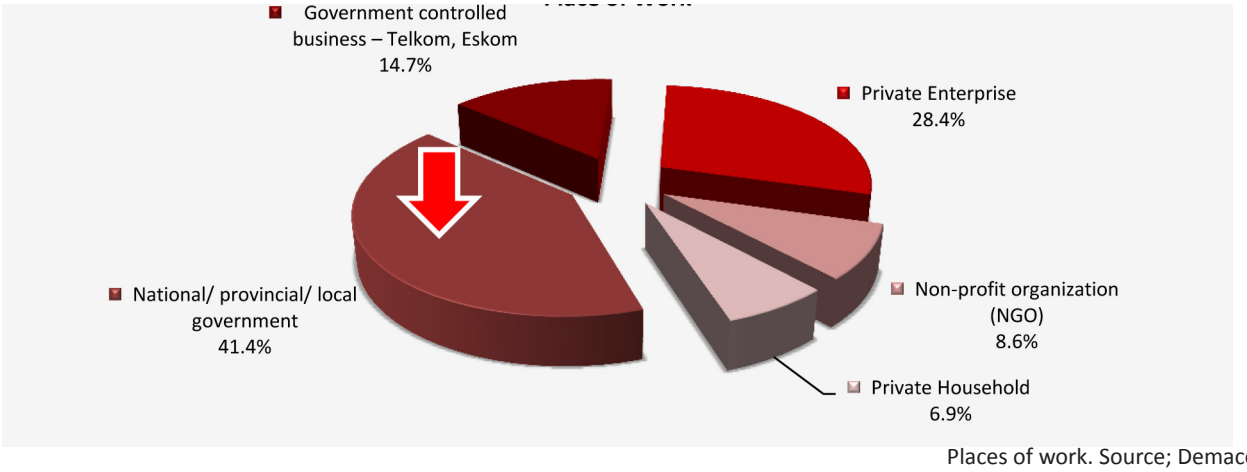
Illustrated in fig. 4, A number of community Micro retailers combine their money and order their consignments at wholesale prices, then divide the goods amongst themselves, based on their contributions. Fundamentally, these traders play a key role within the less fortunate settlements by facilitating trade by breaking bulk, stoking inventory and providing their chosen products in more accessible locations , thus effectively reducing transaction costs for the consumers(Rolfe 2010).

Another culmination of Micro retailers is the hawkers, who characteristically have no permanent structures and generally mushroom around heavy pedestrian routes.

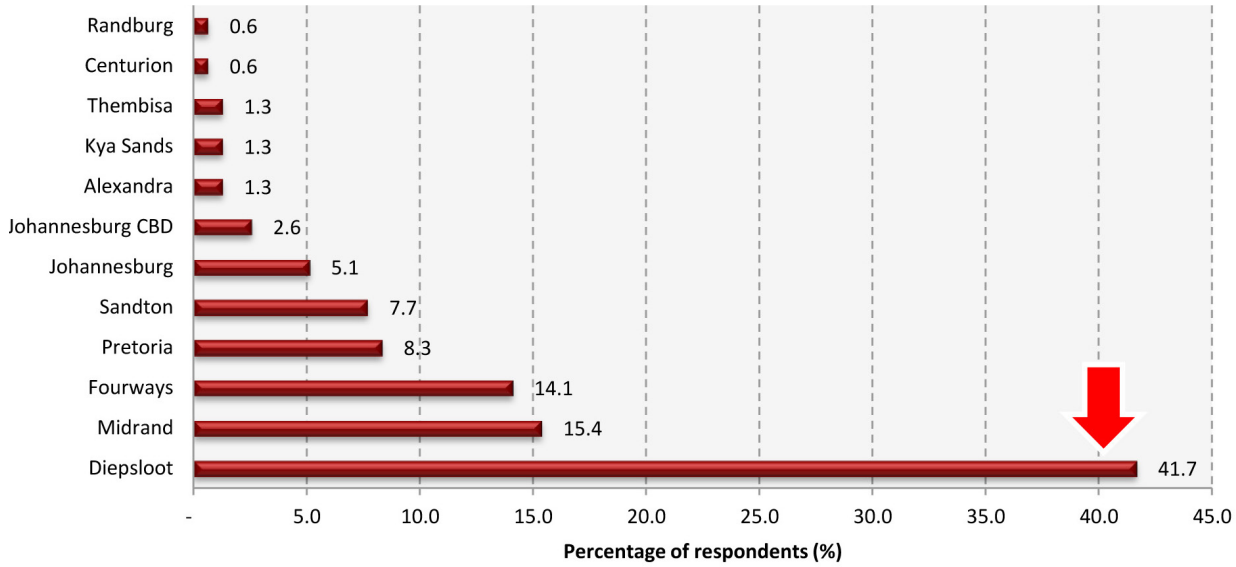
These retailers are described by Rolfe 2010, as being either survivalist, generating minimum income whilst the owners search for alternative means of income. The owners typically consume surplus revenue and reduce their chances of growth. On the other hand, they can be more lasting with the potential to flourish. A survey conducted by Rolfe, Woodward, Ligthelm, and Guimarães in 2010, suggests that Micro retailers that conducted their business away from home, generated more revenue compared to those that ran their businesses from home. Essentially it can be concluded that providing a shelter or destination venue where these micro retailers can be located, will effectively increase their chances to grow more lasting and sustainable businesses.



Types of employment. Source; Demacon 2012



Places of work. Source; Demacon 2012



Places of Employment, Source ; Demacon 2012

1.2 Case study: Occurrence of informal trade, Diepsloot

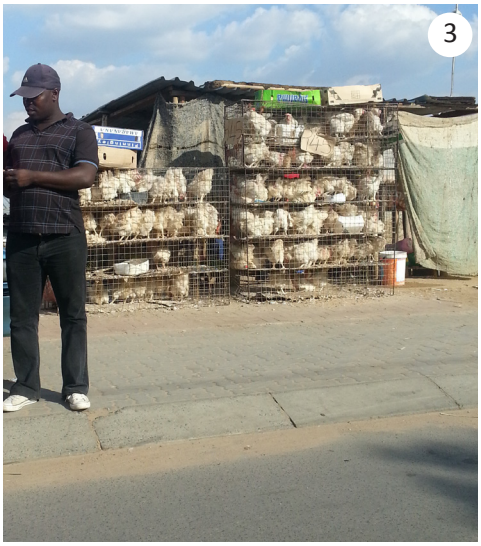
An overall understanding of informal retail in the area will be explored; factors that lead to the development of Micro retail, as suggested earlier by Rolfe 2010, will be examined in this section.

Employment

Statistics generated by Demacon suggest that only 57.6% of the residents of Diepsloot are permanently employed, Plus/Minus 35.4% are self-employed and 15.6% of these are in the informal sector, with an unemployment rate of 53.4%.

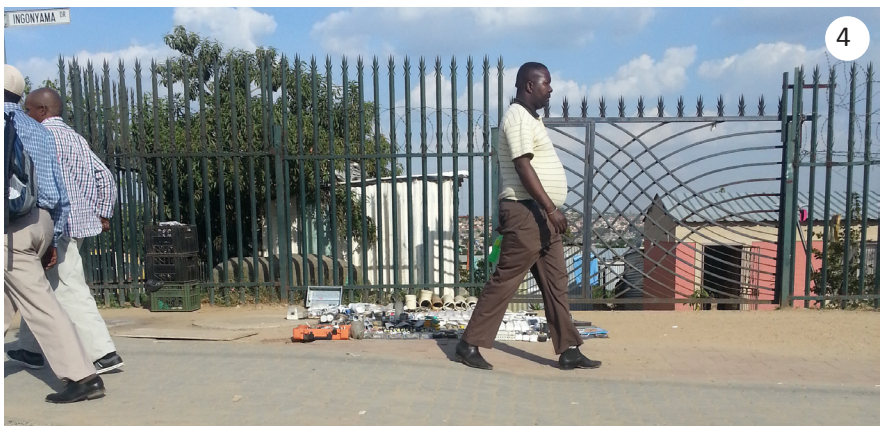
However, 41, 7% of these are employed in Diepsloot itself, which accounts for the high occurrence of Micro retail businesses in the area. This can be considered as proof that Rolfe`s suggestion that the inability of the formal sector to absorb candidates will result in an extinctive survivalist response of self-employment and that these opportunities are usually initiated in the vicinity where the least possible costs can be incurred and hence the 41,7 percent figure employed within the neighbourhood .

Storyboard illustrating the different types of informal retail in Diepsloot is documented in the next section.



HAWKERS

1. Typical fruit & Vegetable, Image by Author
2. Household utilities, Image by Author
3. Fresh chicken, Image by Author
4. Freshly cooked mealies , Image by Author
5. Car Parts, Image by Author
6. Clothes, Image by Author
7. Hardware fittings, Image by Author

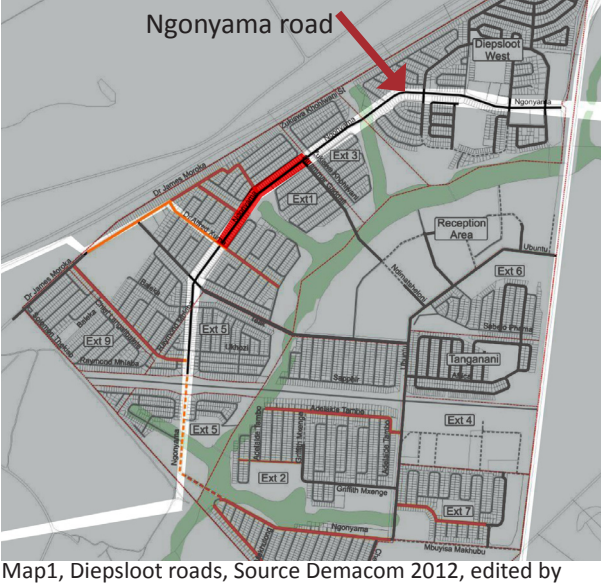


KIOSK / TUCKSHOP (above)

1. Tailor and Shoe Repair, Image by Author
2. Convenience items such as airtime snacks etc. Image by Author
3. Gold Exchange, Image by Author

SPAZA SHOP (right)

1. Fast Food and Convinience, Image by Author
2. TV Repairs, Image by Author
3. Convenience & Fast Food , Image by Author



Map1, Diepsloot roads, Source Demacom 2012, edited by Author

Map2, Diepsloot ,the hawker layer, by Author

Map3, Diepsloot ,the hawker + formal layer, by Author

Rolfe`s definition of the different types of informal retail only holds strong in its differentiation by means of spatial definition and not so much by the goods that are sold. In other words, a spaza shop can be defined as a shop that is run from a residential stand, regardless of the merchandise sold, perhaps variations of specialised merchandise would warrant a different naming within the umbrella name of spaza shop.

In the same light, a tuck-shop or kiosk can be defined as shelter of a permanent nature, operating away from a place of residence in a business-oriented strategic location. A hawker could then be defined as a retailer with no permanent structure for their business activities, regardless of their merchandise, as illustrated in the images documenting the different types of hawkers ranging from hardware, through motor, clothing to food.

These definitions can be translated into the different scales of spatial requirements, if a centralised Micro retail facility is to be designed. It suggests open spaces that can accommodate the hawker type of retailer, semi-enclosed spaces to accommodate the kiosk typology and a closed spatial type for a more permanent type of retail, this being a more opportunist type of retailer. The food/cooking typology should allow for the accommodation of multiple types of food preparation that can accommodate the different cultural culinary abilities.

Ngonyama Road is the main street in Diepsloot and it is accessed directly from William Nicol Road/the R511 and the R114. Most retail takes place on this Road with some adjacent streets feeding off it and for this reason, the indicated portion of Ngonyama Road will be further examined in terms of the occurrence of Micro retail and its typologies.

The Hawker

At first glance, it appears that the hawkers randomly place themselves around a pedestrian high traffic zone, but when overlaid with other business typologies, two things become apparent:

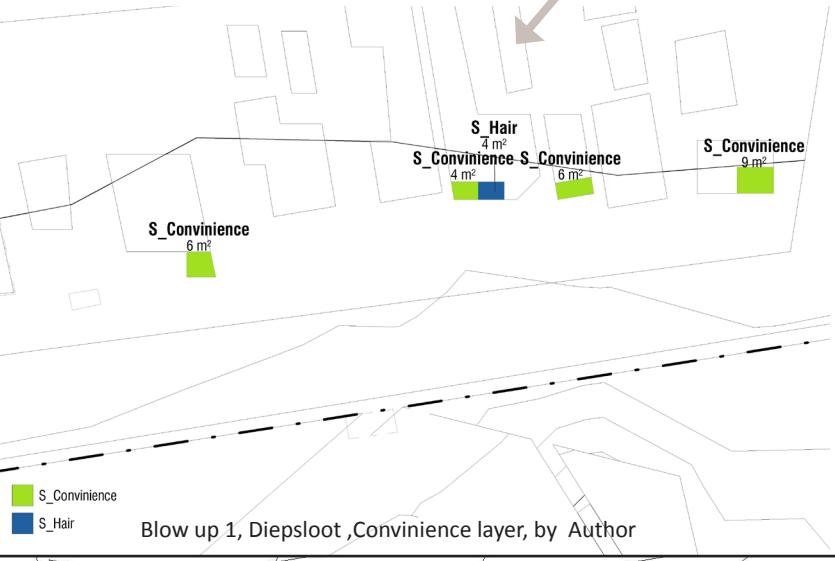
1. Hawkers generally position themselves in front of formal business establishments as illustrated in the map 3,

2. They anchor around intersections and not around formal business establishments as illustrated in map 3.

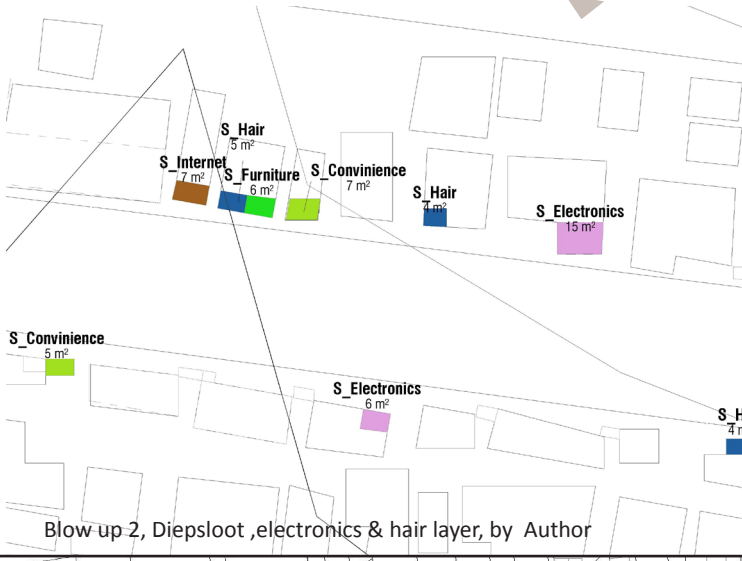
It could be, from a public transport user's point of view, that as one disembarks from a taxi, this is what most hawkers at intersections capitalise on, or perhaps a case of memory from residents points of view, as they are known to position themselves at intersections, thus making it easy for their clientele to access them. When hawkers position themselves around formal businesses, they tend to feed off the foot traffic from the larger establishments. In this case, the relationship could be considered symbiotic and alludes to the idea that every big business calls for the accommodation of other small businesses to compliment it.

- Car parts
- Car wash
- Clothing
- Dishes
- Electronics
- Appliances
- Furniture Second Hand
- Household Utilities
- Hair
- Furniture
- Hardware
- Supermarket
- Fast Food
- Fruits
- Snacks
- Tyres
- Vegetables
- Sanitary

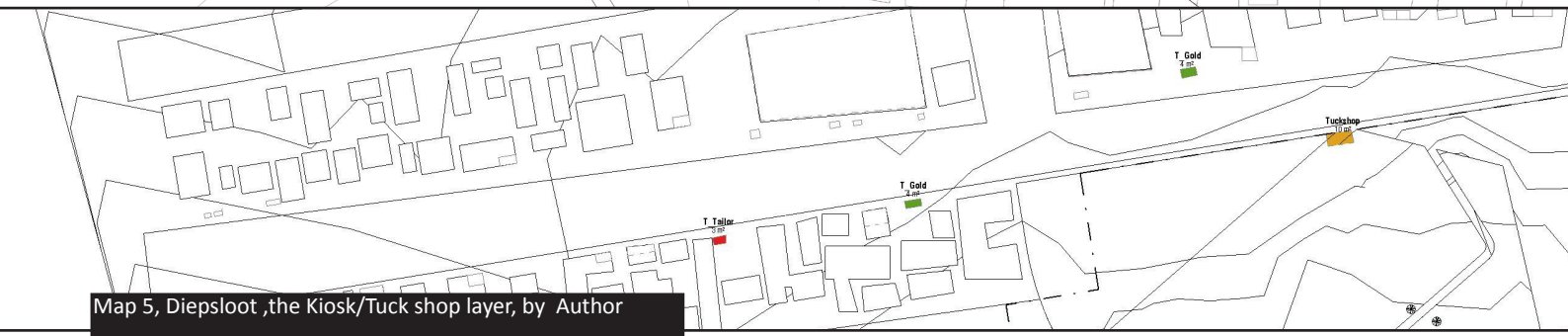
Map4, Diepsloot ,the spaza layer, by Author



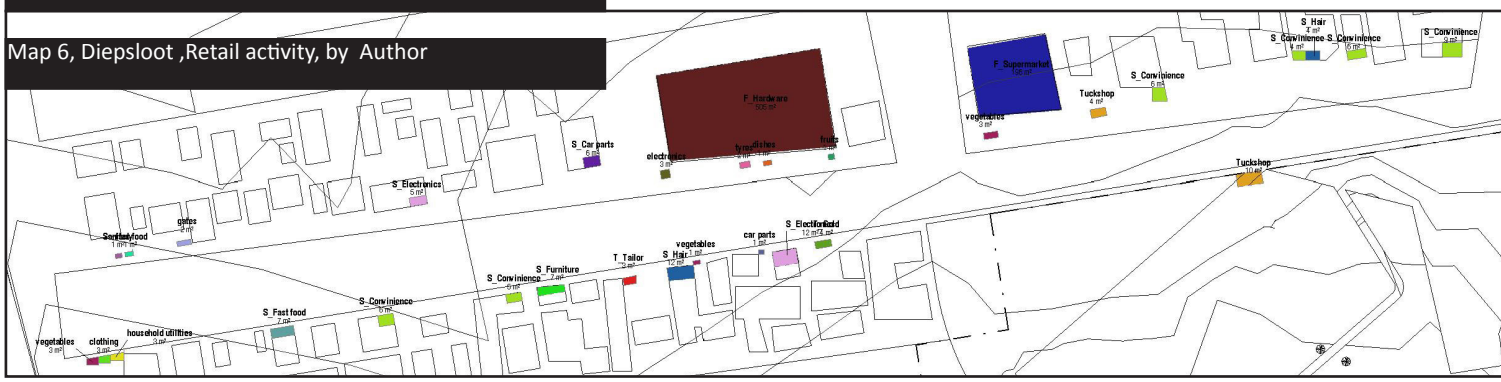
Blow up 1, Diepsloot ,Convinience layer, by Author



Blow up 2, Diepsloot ,electronics & hair layer, by Author



Map 5, Diepsloot ,the Kiosk/Tuck shop layer, by Author

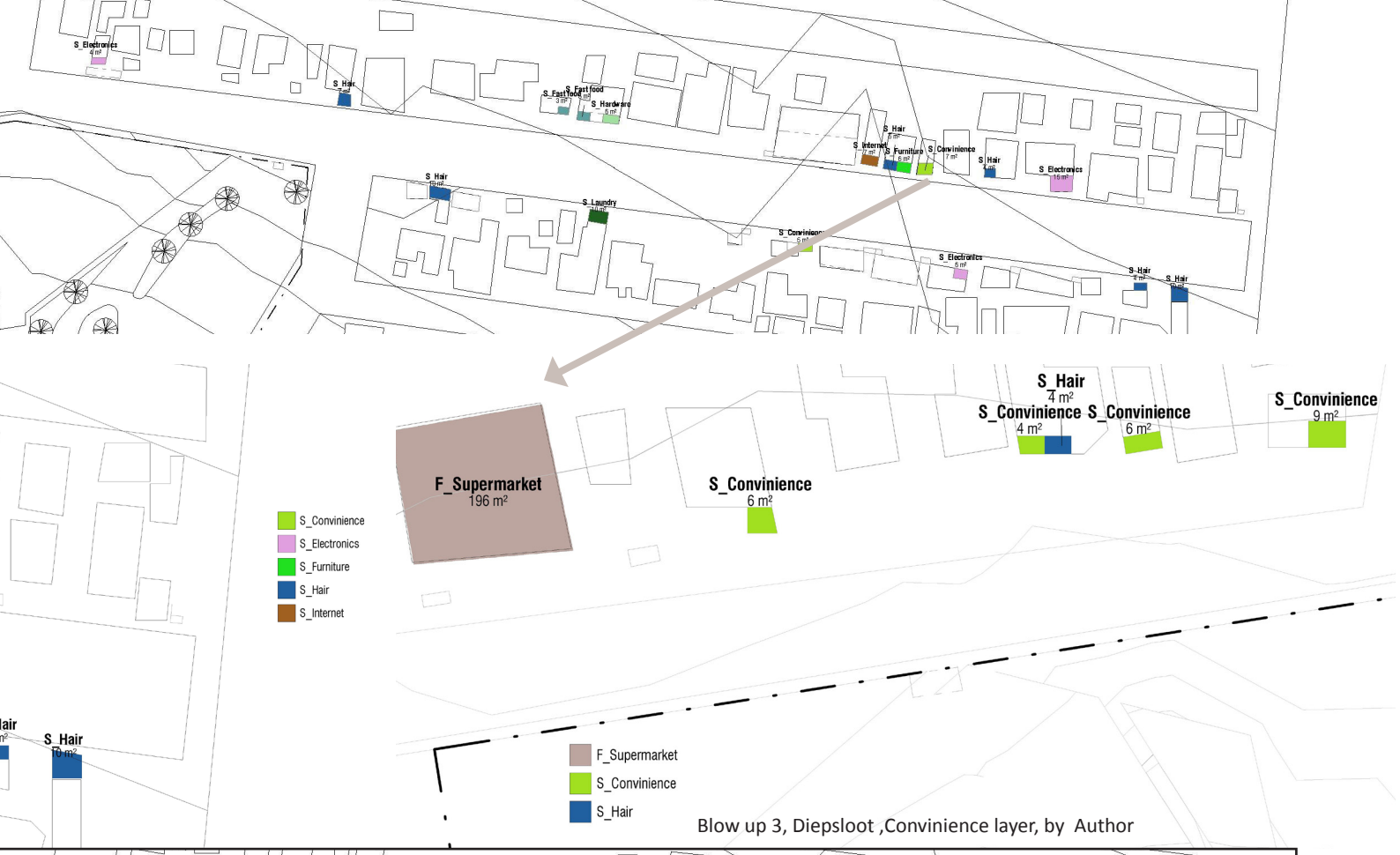


Map 6, Diepsloot ,Retail activity, by Author

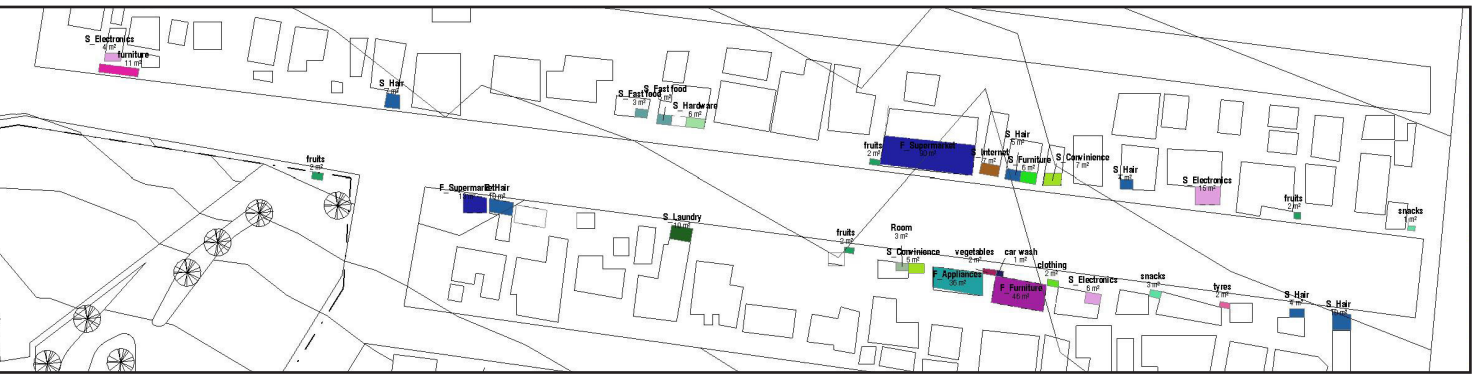
The Spaza Shop

This business typology according to Spaza News, an on-line journal for small business entrepreneurs, (http://www.spazanews.co.za/,2014) is run as a means of survival. No relevant information is disseminated about this sector and there is no communication between these business owners. They essentially end up trading in the exact same products, blow-ups to map 3 illustrate how these businesses concentrate in one area in an unplanned manner. Blow-up 2 illustrates how there are 5 convenience shops within 15 to 20 meters of each other and in Blow-up 1, 4 hair salons within a 10 metre radius. When overlaid business establishment's layer, as illustrated in Blow-up 3, further evidence of the unplanned nature of the spaza shops can be drawn.

A supermarket exists within a 15 metre radius of the convenience shops; this positioning can be perceived as contributing to the stunted business growth and hence the classification as a survivalist type of business.

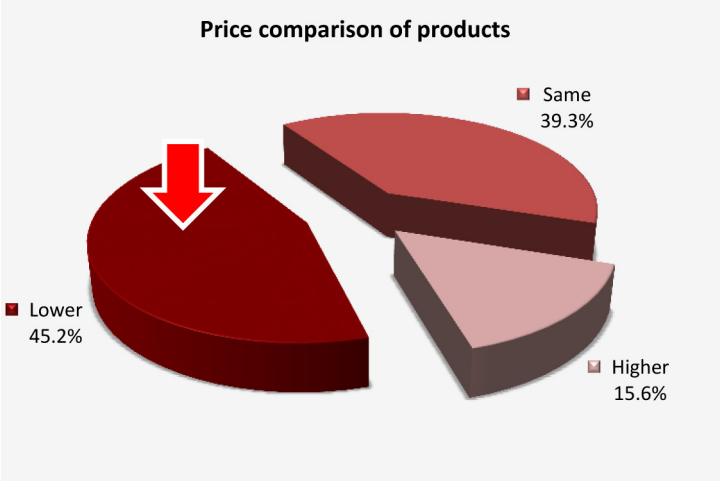


Blow up 3, Diepsloot ,Convinience layer, by Author



The Kiosk or Tuckshop

There are fewer kiosks and tuck-shops in the area. Gold Exchange units dominate the kiosk count and illustrated in map 4 are 2 Gold Exchange kiosks within a 15 metre radius. These are not only limited to the area of study, but are scattered throughout the busy street. Food tuck-shops are not very common and this could be accounted for that as tuck-shops locate themselves quite specifically, the area in question is saturated with convenience-type spaza shops, which would naturally discourage the opportunistic entrepreneur from establishing their businesses in the area.



Source ; Demacon 2012

Source ; Demacon 2012

The Spaza Shop

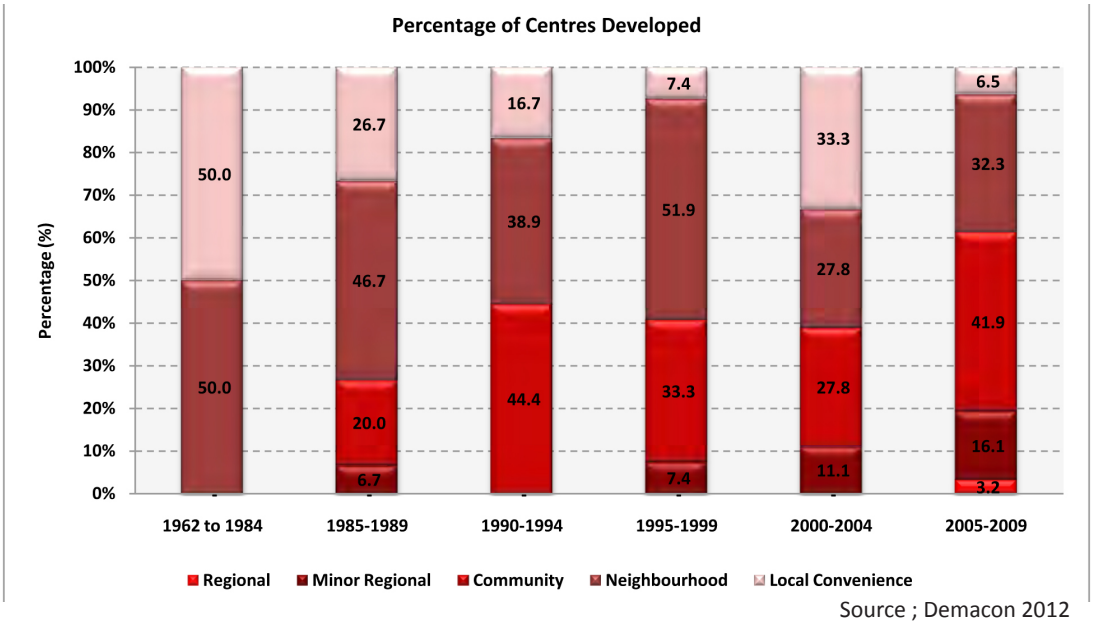
The bulk of the products sold at these main forms of Micro retail establishments have prices ranging from the same to lower, compared to the products sold in formal establishments, as illustrated in the chart generated by Demacon(2012). The quality of their products is, however, on average lower than that sold in formal shops. If the view that high quality goods attract good business, then it can be established that quality control is necessary in order to improve business.

Commercial retail, on the other hand, manifests itself in an even wider range. Focus in this thesis will, however, be placed on shopping malls, as the occurrence in the townships and informal settlements, i.e. "The emerging economy", is on the increase.

1.3 Effects of Commercial development in townships, Case Study

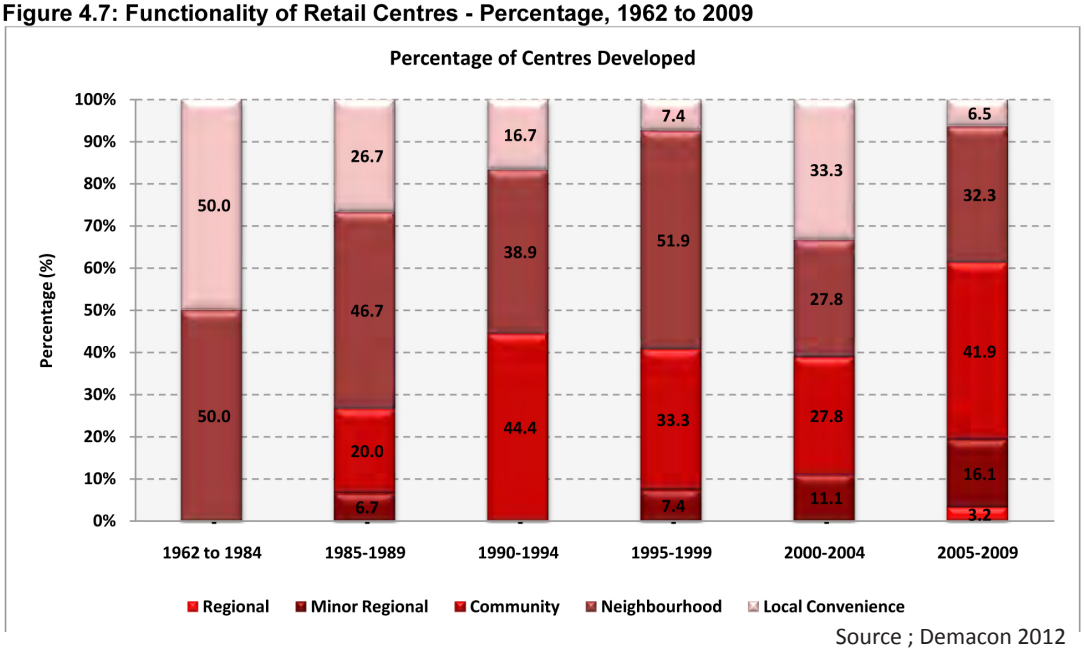
Commercial retail developments are classified in several different categories. Table 1 gives a brief description of the different types.

Of these classification types, 5 have been implemented in the emerging economy, i.e. Rural areas and townships. Chart 1 below illustrates the percentage of centres developed in the period from 1962 to 2009, as provided by Demacon, 2012.



Source ; Demacon 2012

Figure 4.7: Functionality of Retail Centres - Percentage, 1962 to 2009



Source ; Demacon 2012

Table 4.1: SACSC Retail Centre Classification

Type of Centre	Size of centre (m²)	Trade area	Access Requirements	No. of households	Socio-economic groups	Average Radius (km)	Median Travel time (minutes)	Main tenants
Small free-standing centre	500 – 1 000 Less than 10 stores	Serves part of a suburbs	Suburban street	<2 000	Mainly middle, middle low and low LSM 4-7	1	<2	✓ Café/Superette ✓ Few convenience stores ✓ Less than 10 stores
Local convenience centre	±1 000 - ±5 000 5-25 stores	One suburb or parts of suburb(s)	Minor collector road	700 - 3 600	All LSM 4-10	1,5	3	✓ Supermarket ✓ Few convenience stores ✓ 5 – 25 stores
Neighbourhood centre	±5 000-±12 000 25-50 stores	Strategically located for a group of suburbs	Major collector roads	2 400 –5 700	All LSM 4-10	2,0	4-9	✓ Supermarket ✓ Convenience ✓ Some small specialised stores
Community Centre	±12 000-±25 000 50-100 stores	Strategically located to serve a suburban community.	Major arterial road	8 500 - 17 800	All LSM 4-10	3,0	6-14	✓ Large supermarket ✓ Convenience ✓ Small national clothing ✓ Restaurants & takeaways ✓ Services
Small regional	±25 000-±50 000 75-150 stores	Specific sub-region of city (can be large self contained community (i.e. Chatsworth)	Major suburban arterial road linking to a provincial highway	17 800-35 700	All LSM 4-10	5,0	10-16	✓ Large supermarket ✓ 1 or 2 large clothing anchors ✓ Strong national tenant comparison goods component ✓ Boutiques ✓ Restaurants ✓ Entertainment ✓ Services
Regional centre	±50 000-±100 000 150-250 stores	Large region of city/or whole city	Major arterial road usually a Provincial main road linking to a National road.	28 600 – 57 150	All LSM 4-10	8,0	14-20	✓ Large supermarket/hyper ✓ 2 or more large clothing ✓ Small clothing and boutiques ✓ Entertainment restaurants ✓ Services ✓ Convenience
Super regional centre	>100 000 More than 250 stores	Large region in city and surrounding areas/Tourists	Major arterial road usually a Provincial main road, linking to a National road.	57 150- 114 300	Above average LSM 5-10	10+	16-28	✓ As at regional but more emphasis on entertainment and variety
Specialist/ entertainment Theme, centre/Life Style centre	Vary from 10 000 to 30 000	Depend on type of store or centre - mostly on regional level	Major urban arterial main road.	5 700 – 85 700	Mainly above average LSM 7-10	5-10	10-30	✓ Specialist traders/ entertainment and/or theme centre
Value Centre	10 000 – 45 000	Next to regional centre or on main road/highway	Major urban arterial main road.	4 800 - 23 800	Middle to above average LSM 6-10	3-6	10-15	✓ Emphasis on big box retailers ✓ Specialist retailers ✓ Home improvement ✓ Limited groceries ✓ Fast food

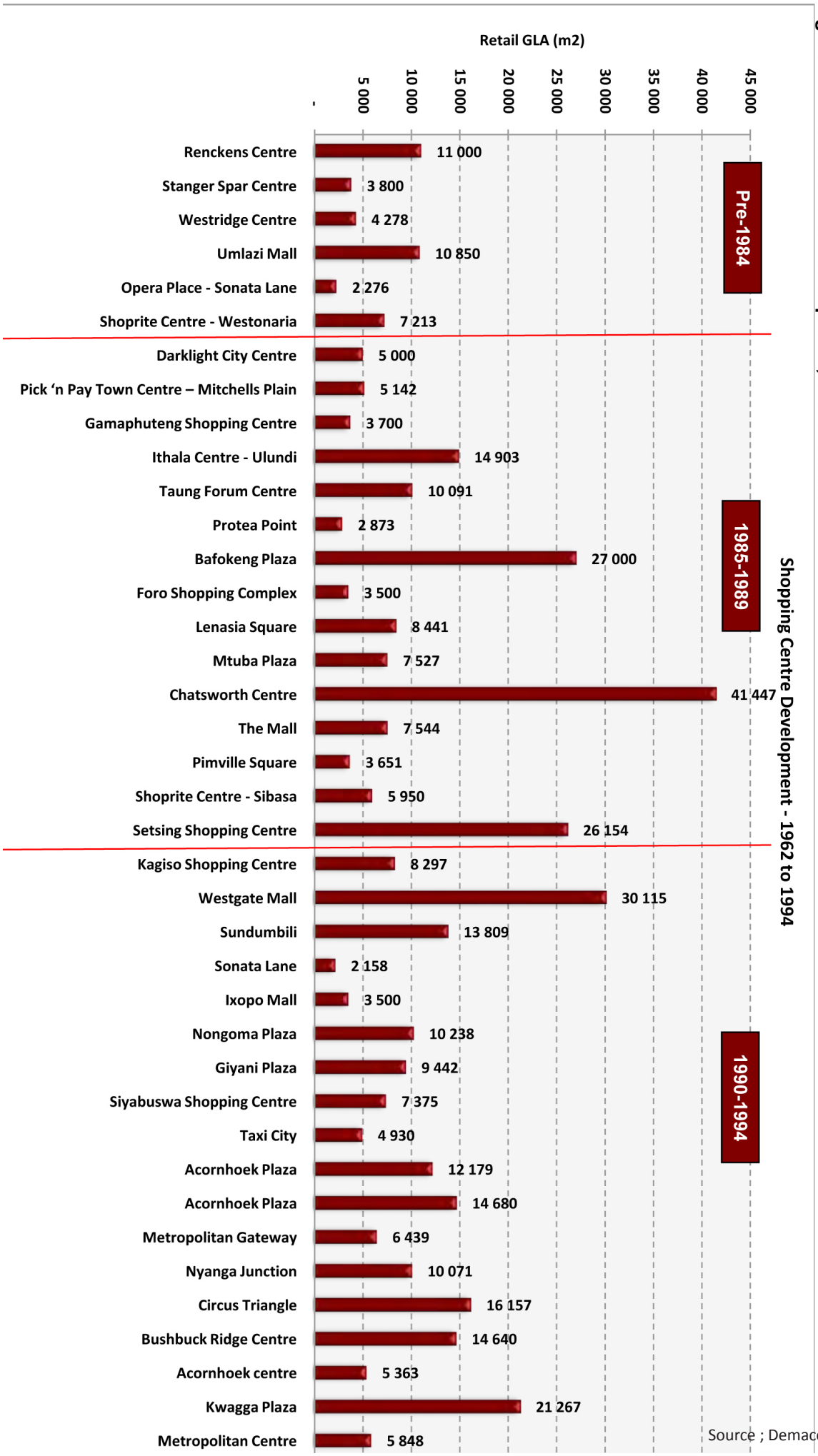


Figure 4.9: Retail Centre Development, 1962 to 1994

Source ; Demacon 2012

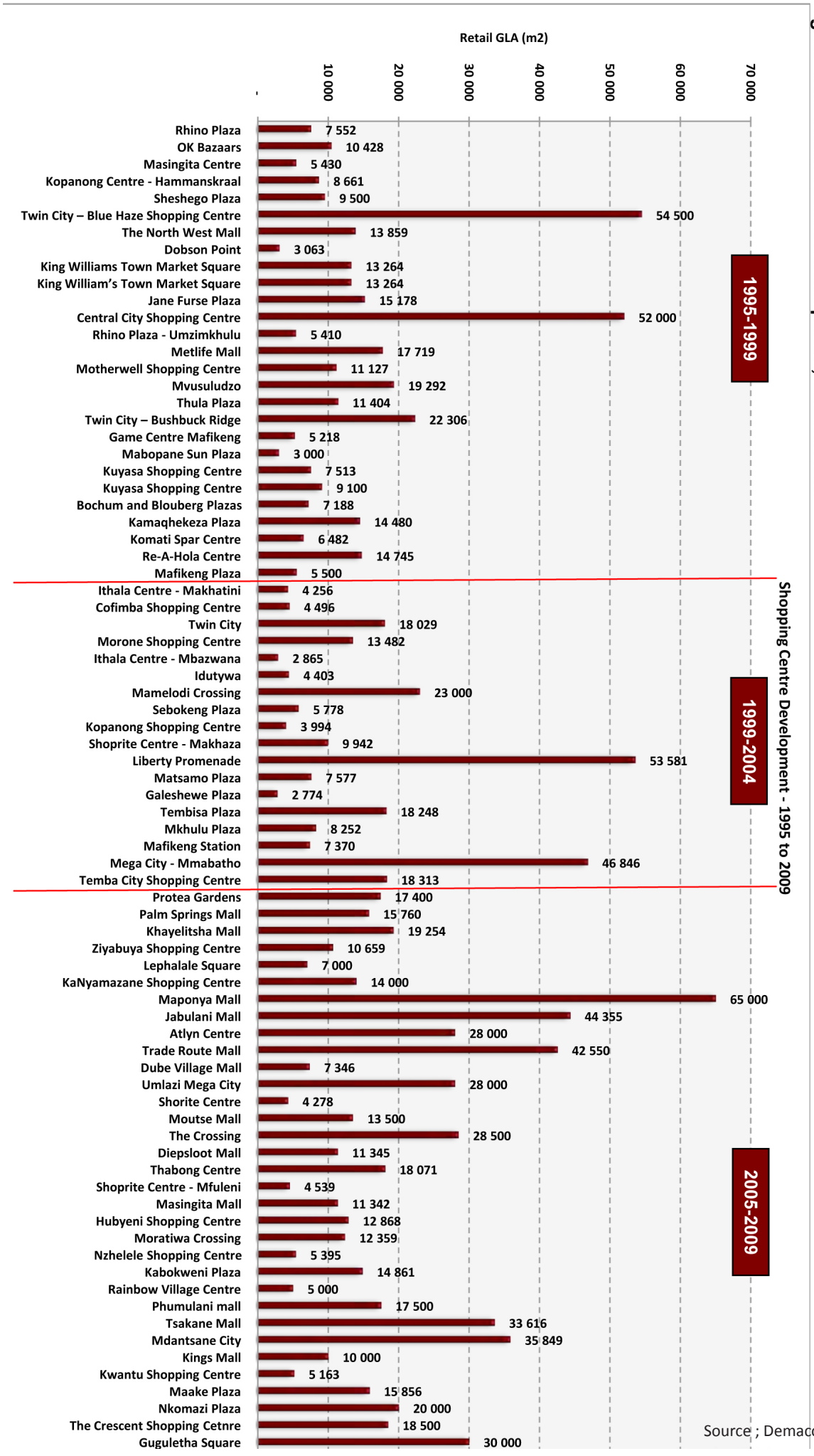
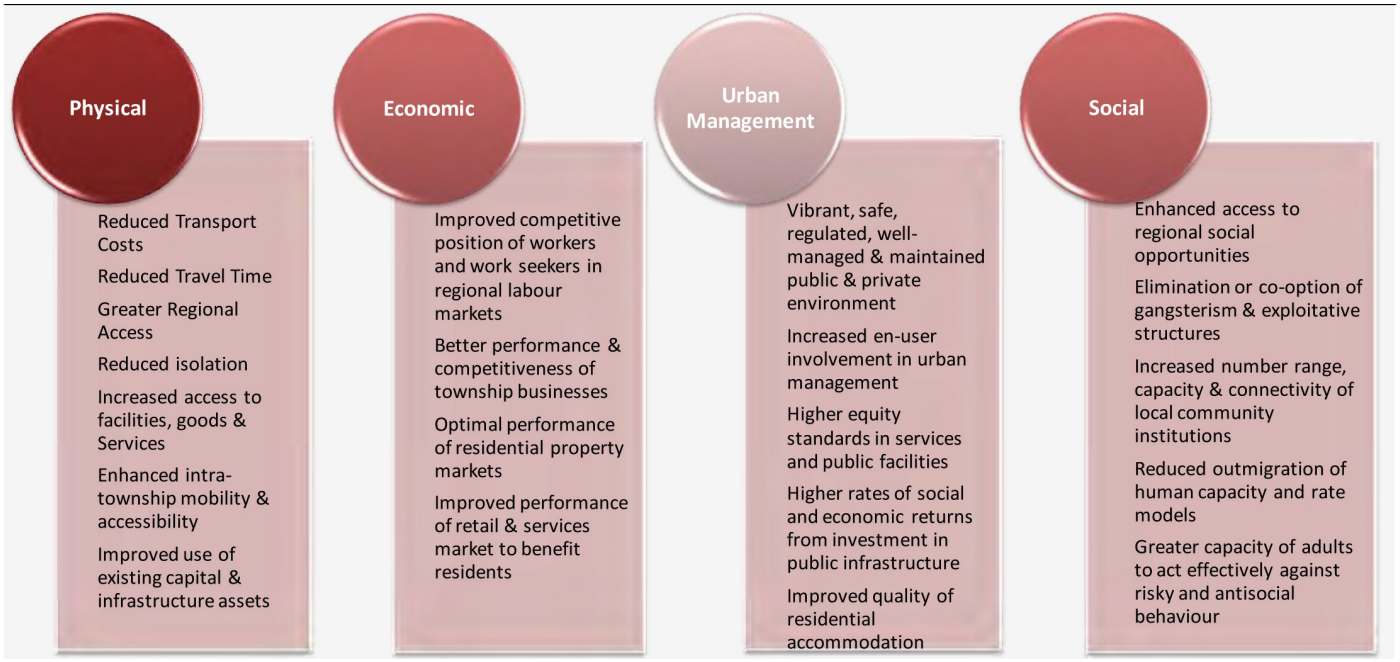


Figure 4.10: Retail Centre Development, 1995 to 2009

Source ; Demacon 2012

	Investment Value (R'million)	Business Sales (R'million)	Permanent Jobs	Business Taxation (R'million)	Rates and Taxes (R'million)
1980s	2 371	3 831	6 100	278	19
1990s	7 328	11 838	18 800	858	57
2000s	11 454	18 503	29 400	1 341	90
Total	21 153	34 171	54 300	2 477	166

Source ; Demacon 2012



Source ; Demacon 2012

Chart 2 gives a timeline and the gross rentable areas (GLA) of some of the developed retail centres since 1962.

There has been a general increase in community type retail development since 2005 and the average size of developments increased from 6500m² to about 20,000m², with the local convenience centres becoming less popular but increasing in size. The largest centres increased from 11,000m² to 65,000m²(Maponya Mall). These increases in GLA proportionally resulted in increased revenue, investment and permanent jobs over the years, as illustrated in Table 3.

Although these figures indicate growth in the broader picture, a true indication of their impact on the local economies and local business environment will be investigated in the following Section through the examination of case studies.

Commercial retail developments in the townships form part of the Government's effort at township regeneration. A summary of the key targeted issues in this renewal programme is summarised in the Table 4

These factors will be used as a basis for the assessment of the retail centres main factors investigated, in order to establish a base point for this assessment which includes:

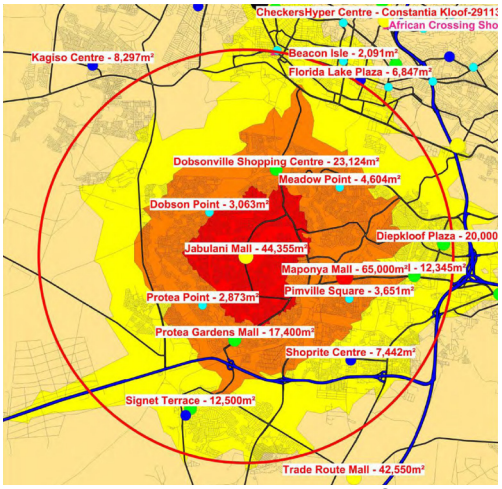
1. Profile of the centre, location and surrounding supply
2. Primary consumers socio economic profile
3. The impact of the development on the local community and economy

All figures, statistics and surveys in this Section are sourced from a market study conducted by Demacon in 2010 (Online source)

Centre size	44 355m² retail GLA
Location	Cnr Koma and Bolani Roads
Date of development	2006
Number of retail floors	1
Number of shops	104
Number of parking bays	156 covered 7 265 open
Anchor tenants	Shoprite – 4 000m² retail GLA Game – 6 000m² retail GLA Edgars Woolworths
Owner	Resilient Properties (Pty) and Masingita Property Investment Holdings (Pty) Ltd
Developer	Greenwold Property Developments (Pty) Ltd

Source ; Demacon 2012

Source ; Demacon 2012



Source ; Demacon 2012

1.31 Case study; Jabulani Mall, Soweto

As indicated in Table 4, Jabulani Mall is classified as a minor regional centre, with a GLA of roughly 44 355m², which translates to a total of 104 shops housed in the building. A total of 1800 jobs were created by the centre development.

The main anchor tenants as indicated in the plan, are Shoprite Checkers , Edgars, Woolworths and Game. The Mall`s location with reference to existing retail centres within a 10km radius is illustrated in Map 4.

There are 12 retail developments within a 10km radius, with Jabulani Mall being the second largest. Supply, therefore, constitutes a regional centre, 5 community centres, 2 neighbourhood centres and 4 convenience centres and it can be concluded that generally, there is high supply within that 10 km radius. As indicated in the previous Chart 2, 5 of these developments were developed after 2000 and this can be perceived as growth within retail investment.

1.32 Primary consumer socio economic profile

According to Demacon,2010, there are about 355 937 households that the development serves, predominantly Black, with the highest population demographic being the young and potentially economically active as illustrated in Chart 4. There are low levels of education, suggesting a less sophisticated consumer market. Blue collar workers dominate the population, suggesting a low to middle-income consumer.

1.33 The impact of the development on the local community and economy

Demacon 2010's findings reveal the weakness and the strengths of retail development in the area. Although the development boasts of reduced travel costs for consumers, reduced travel times, improved quality of goods and competitive prices, the development has overly resulted in the closure of local businesses and a decline in informal trade.

1.4 Other Case studies; Umlazi Mega city, Durban, Thula Mall,Mpumalanga

In both case studies where investigations similar to those conducted at Jabulani Mall were conducted, it has become evident that while there are positives drawn from these developments, local businesses are threatened with closure and informal traders are bound to lose their businesses.

Source ; Demacon 2012

	Change	Impact
Changes in shopping location:		
Hazyview	23.9% to 22.7%	↓
Acornhoek	20.4% to 11.4%	↓
Bushbuck Ridge	31.0% to 31.8%	↑
Nelspruit	23.9% to 15.9%	↓
Other Areas	0.9% to 18.2%	↑
Percentage of shopping conducted outside the local areas	50.8% to 35.7%	↓
Percentage of shopping at local traders	30.9% to 27.0%	↓
Average transport cost:		
Retail centre	R19.5 to R7.2	↓
Local traders	R16.0 to R17.1	↑
Average travel time:		
Retail centre	32.7min to 9.1min	↓
Local traders	26.2min to 21.4min	↓
Monthly household retail expenditure	R534.2 to R1 103.9 Thula Plaza – R782.6	↑
Impact on local traders:	Slight to large decline in support – 85.7%	↓
1. Everything remained the same	34.8%	Constant
2. Decline in informal traders	25.4%	Negative
3. Closure of local businesses	13.5%	Negative
4. Movement of local businesses closer to the mall	5.8%	Positive
5. Informal traders moved closer to the mall	3.8%	Positive
6. Movement of local business to the mall	1.9%	Positive
Overall impact of Thula Plaza		
8. Reduced average travel cost	87.0%	Positive
9. Reduced average travel time	87.0%	Positive

Source ; Demacon 2012

Percentage of shopping conducted outside the local areas	49.9% to 34.2%	↓
Percentage of shopping at local traders	18.9% to 16.5%	↓
Average transport cost:		
Retail centre	R13.1 to R12.3	↓
Local traders	R10.6 to R8.5	↓
Average travel time:		
Retail centre	18.8min to 12.4min	↓
Local traders	9.4min to 7.4min	↓
Monthly household retail expenditure	R974.9 to R1 633.1 Umlazi Mega City – R1 016.4	↑
Impact on local traders:	Slight to large decline in support – 50.0%	↓
1. Everything remained the same	56.1%	Constant
2. Movement of local businesses closer to the mall	8.4%	Positive
3. Closure of local businesses	6.5%	Negative
4. Informal traders moved closer to the mall	6.5%	Positive
5. Decline in informal traders	4.7%	Negative
6. Movement of local business to the mall	4.7%	Positive
Overall impact of Umlazi Mega City		
1. Provide good quality goods and services locally	84.0%	Positive
2. Reduced average travel cost	84.0%	Positive
3. Reduced average travel time	83.0%	Positive
4. Centre provides a safe and secure retail destination	82.1%	
5. Centre provides a variety of goods and services to choose from locally	81.1%	Positive
6. Centre offers higher levels of credit locally	81.1%	Positive
7. Centre provides more affordable goods and services locally	81.1%	Positive

Source ; Demacon 2012

"The informal sector forms the economic foundation of many Black communities, with profits being circulated within the township and supporting downstream industries. Informal trade is also one of SA's biggest employment creators. It is therefore important to protect these traders against the impact of formal retail centres in these areas."(J. Muller, 2008 Source: Online)

Flanagan 2013, in his lecture for Stanlib, on how shopping centres got it wrong, highlighted his view on why these centres are such a failure and he believes that they are a prototype directly transplanted from Sandton City to the township, thus completely ignoring the culture and demographics of the area. One such culture he highlights is that of going out for breakfast. He notes how the Mugg & Bean restaurant has never been more than 20% full and explains how people in the township would much rather settle for homemade breakfasts, as it is much cheaper. This view, however, addresses the issue of tenancy and tenant mixes and one can argue that perhaps simply by replacing such a tenant with a more appropriate one, could solve the problem. Flanagan 2013 as McGaffin 2011, question the size of these developments with evidence presented earlier on how there has been a shift toward community-type centres, suggesting that investment perhaps experienced setbacks with larger sized developments from the previous years. McGaffin 2011:27, poses a similar question to which this thesis questions, "the application of the traditional retail business model… is this the best model for market development in these areas, and does this model act as a catalyst for further economic development there?"

1.5 The comparison

The Table 6 summarises the findings from the investigations into small businesses and large ones and it outlines the tensions that exist within the retail industry in townships.

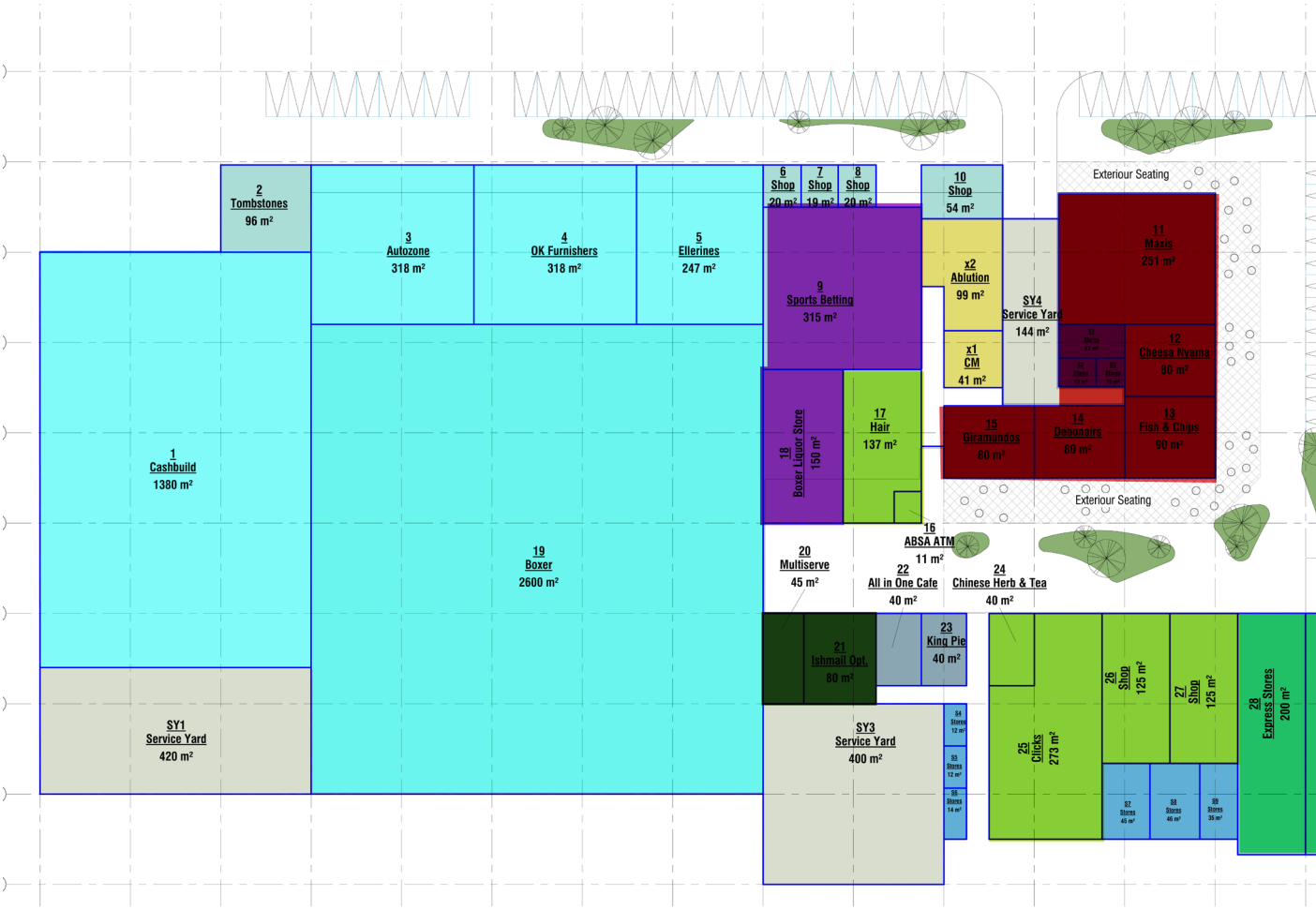
The contribution of large retail establishments is appreciable and their ability to create larger numbers of jobs and attract more investment opportunities is commendable, although the general assumption seems to be that the small local businesses do not have the ability to grow and perhaps replace the large chain stores, effectively empowering the local economy even more. Perhaps the approach to solving this problem of local businessmen losing their businesses, does not lie in the size of the developments as previously suggested by Flanagan (2013), but in a total mind shift resulting in the creation of a new hybrid that is not aimed at disempowering the local businesses, but growing them and creating a support structure that accommodates their different scales. This new typology will further be discussed in the next Section.

Number of people	✓ 1.3 million
Number of households	✓ 355 937
Household Size	✓ 3.6
Household density	✓ 2 192.7 households/km^2
Racial distribution	✓ African blacks – 88.4% ✓ Coloureds – 6.2% ✓ Asian – 5.1% ✓ White – 0.3%
Age profile	✓ 0-14: 25.1% ✓ 15-19: 9.2% ✓ 21-35: 32.2% ✓ 36-65: 29.4% ✓ 65+: 4.1%
Educational attendance (aged 5 to 24 years)	✓ School: 58.9% ✓ None: 32.7% ✓ Pre-school: 3.4% ✓ College: 2.2% ✓ Other: 2.8%
Highest level of education (aged 20 and older)	✓ Higher: 6.1% ✓ Grade 12: 27.5% ✓ Some secondary: 40.5% ✓ Some primary and primary: 17.8% ✓ None: 8.2%
Level of employment	✓ EAP: 69.7% ✓ Employed: 48.9% ✓ Unemployed: 51.1%

Source ; Demacon 2012

Changes in shopping location:		
Soweto	33.3% to 39.7%	↑
Roodepoort	12.7% to 17.4%	↑
Jhb CBD	42.0% to 28.9%	↓
Other	12.0% to 14.0%	↑
Percentage of shopping conducted outside the local areas	60.5% to 35.5%	↓
Percentage of shopping at local traders	25.3% to 14.2%	↓
Average transport cost:		
Retail centre	R15.6 to R10.4	↓
Local traders	R12.7 to R19.7	↑
Average travel time:		
Retail centre	25.3min to 15.2min	↓
Local traders	16.3min to 10.6min	↓
Monthly household retail xxpenditure	R1 260.00 to R1 503.09 Jabulani Mall – R1 163.66	↑
Impact on local traders:	Slight to large decline in support – 42.6%	↓
1. Everything remained the same	76.4%	**Constant**
2. Closure of local businesses	38.5%	**Negative**
3. Decline in informal traders	25.0%	**Negative**
4. Movement of local business to the mall	22.0%	**Positive**
5. Movement of local businesses closer to the mall	25.0%	**Positive**
6. Informal traders moved closer to the mall	16.5%	**Positive**
Overall impact of Jabulani Mall		
1. Reduced average travel time	77.1%	**Positive**
2. Reduced average travel cost	76.1%	**Positive**
3. Provide good quality goods and wervices locally	73.1%	**Positive**
4. Centre provides more affordable goods and services locally	71.6%	**Positive**
5. Overall the centre improved the convenience of conducting shopping locally	71.3%	**Positive**

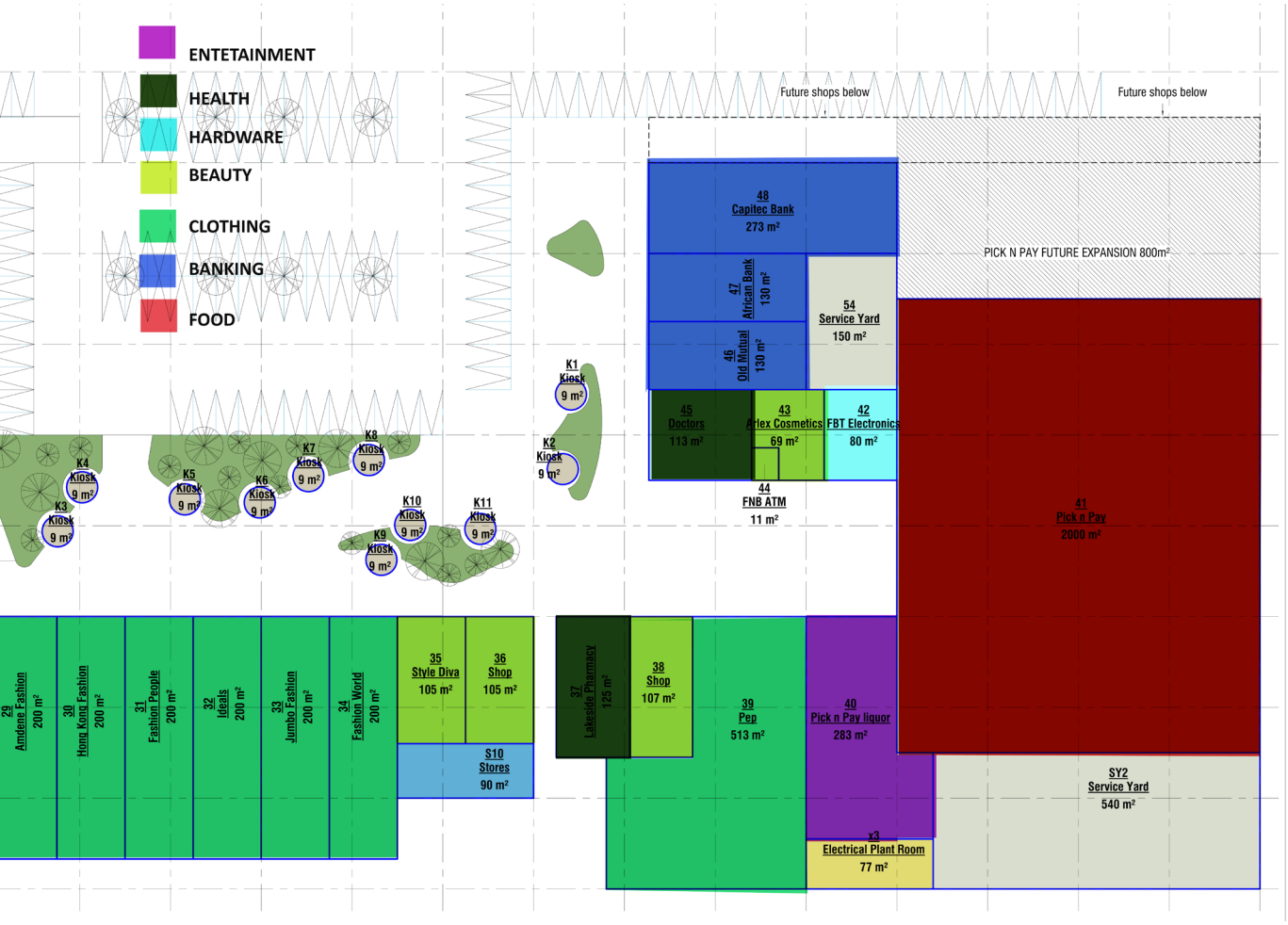
Source ; Demacon 2012



Lakeside mall, Sketch by Paragon architects, edited by Author

Figure 2.4: Understanding Retail and Commercial Township Markets

Source: Demacon Ex. TTRI, 2010



Informal Settlement: The New Hybrid Typology

According to the Department of Treasury (2009, Online) township economies can be grown in the ways listed below:

- Creating new enterprises;
- Attracting investment from outside;
- Growing existing businesses.

This new hybrid typology is aimed at creating a framework in which, "...economically viable enterprises which can stand on their own feet without perpetual subsidy and can make a positive contribution to the growth of real income and therefore to better living standards."(Staley and Morse, 1965, p. 318; see also Cook, 2001)

A typical mall can be broken down into its typical components, those being, Entertainment, Health, Hardware, Beauty and Cosmetics, Clothing, Banking, Food and Convenience.
The new hybrid typology attempts to create a retail model that responds more to its locality and demographics, as opposed to merely re-pronouncing the 'traditional' means of creating a vibrant node. It highlights one aspect, the Food, as the main driver and basic need and develops as a response to the existing conditions as the precedent on how the remaining elements of a mall could adapt and develop in an informal settlement.

This thesis identifies Diepsloot, an informal settlement located north of Johannesburg, as a canvas with which this typology that creates a mutually beneficial relationship between small local retail enterprises and proposed large ones, both not only contribute to the creation of a vibrant urban node , but also to the socio-economic and ecological upliftment of the community as a whole.

At a Micro retail level, it deviates from the typical copycat mentality, by introducing a new breed of trained Micro retailers, who will trade in a unique product that does not exist within the Micro retailers' scope within this community, however responds to an increased demand generated by the cross culture exchange within the settlement. This actively increases the skills set, respects the existing Micro retailers' trade and creates more self-employment opportunities that have lasting long term opportunities.

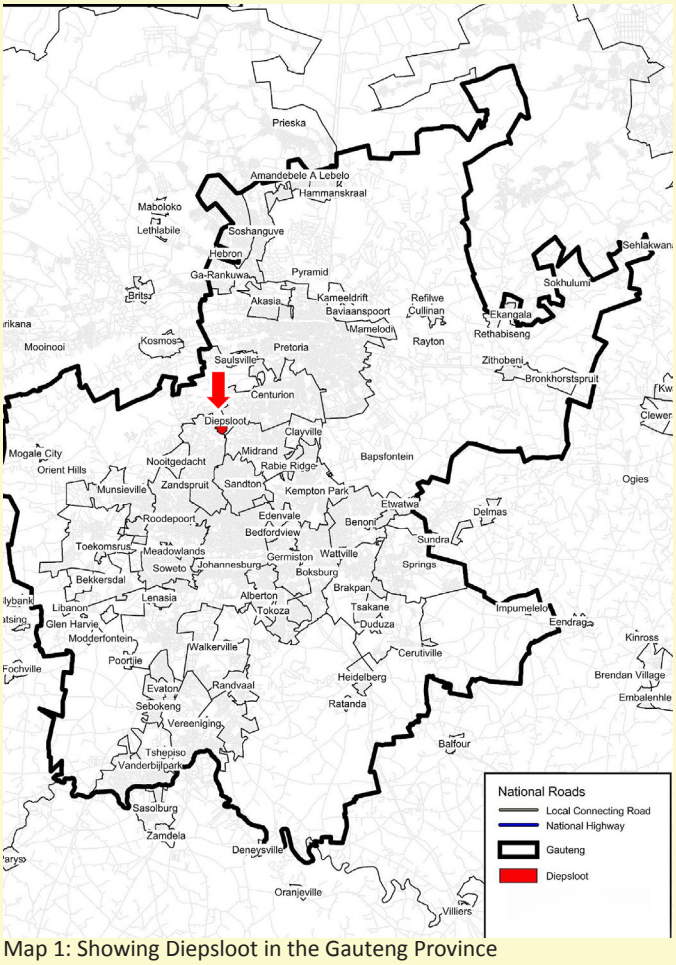
WATER HANDLING

URGENT NEED TO ADDRESS SANITATION

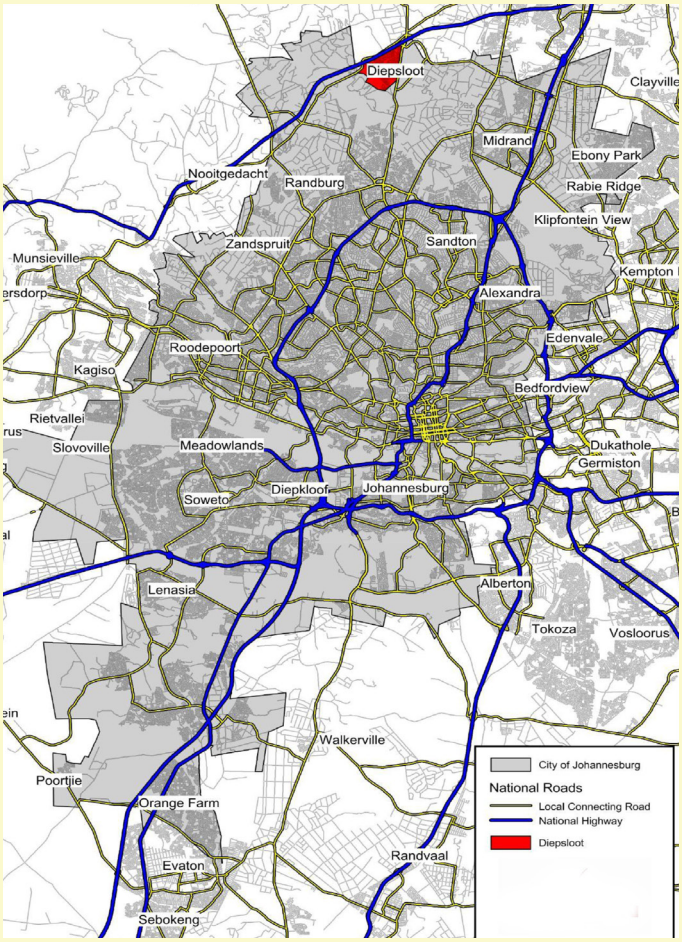
Retail developments in the emerging market should be firmly founded within the knowledge and understanding of their context, in order in to create a mutually beneficial relationship between the businesses, social and physical surrounding needs of these communities. This chapter is aimed at creating this knowledge base of Diepsloot ,by establishing its environmental, social and economic profile. Furthermore,its site site-specific profiles that will inform the design of the development

1. Area Study
2. Economic Status Quo
3. The Site

CHAPTER 02



Map 1: Showing Diepsloot in the Gauteng Province
Source: Demacon 2012



Map 2: Diepsloot within Johanesburg, Source :Demacon 2012

Diepsloot is an informal settlement that lies to the north of Johannesburg, positioned between the affluent neighbourhoods of Dainfern, Northgate, Fourways and Sunninghill.

Map 3 illustrates its dense, impoverished and unplanned nature, which contrasts sharply with its surrounding high income developments as illustrated in images a and b.

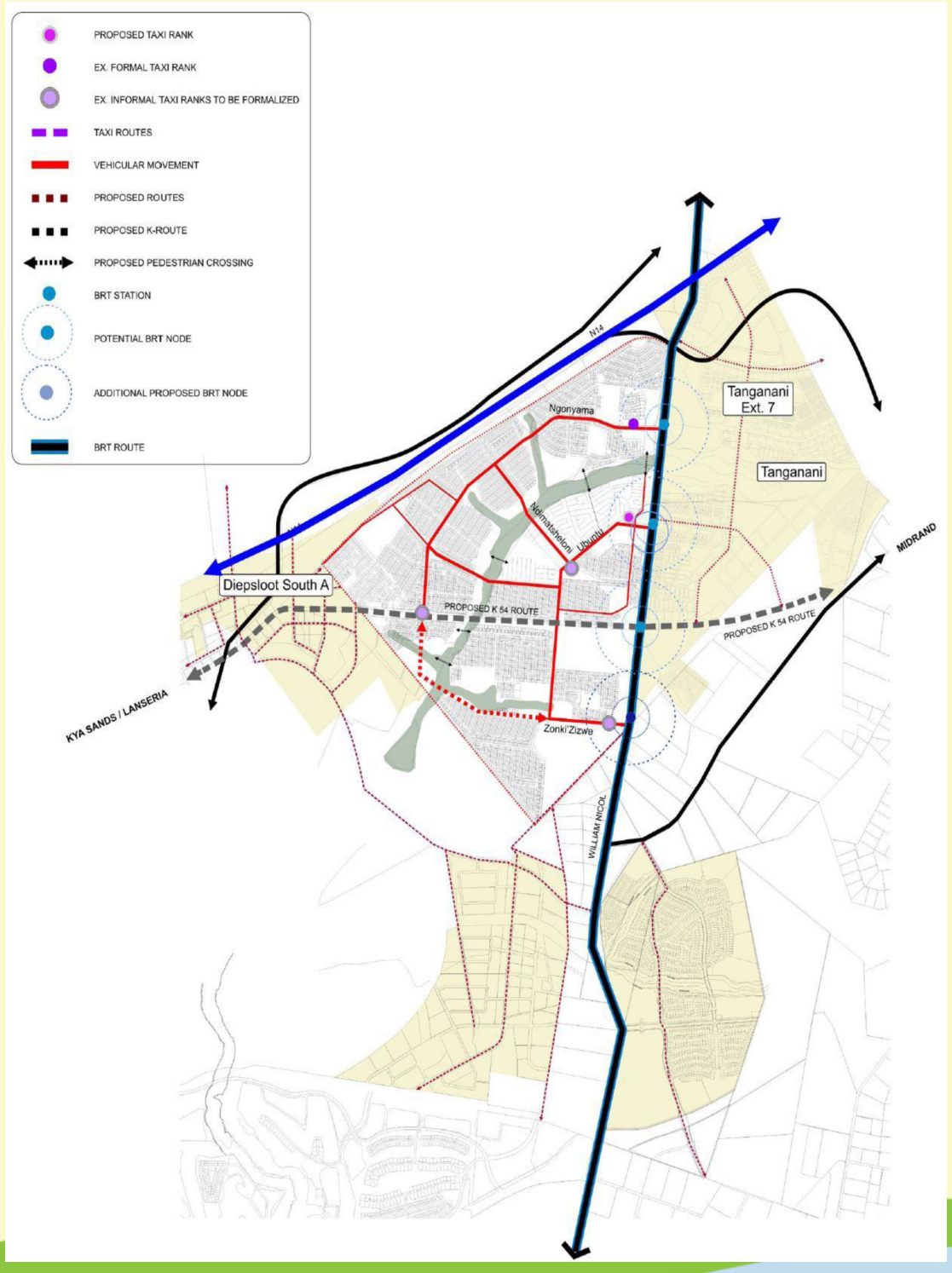
Illustrated in map 4, are the two major toll free road infrastructure N14 and R511/ William Nicol, that sandwich the settlement making it relatively well connected to the city.

According to Anton Harber(2011), Diepsloot was established post-aparthied in 1994. Initially, the settlement comprised of relocated residents from Zevenfotein. The population increased, as there were additional residents relocated from Alexandra informal settlement during the de-densification period.

Map 3: Diepsloot , Source :Demacon 2012

Image a : showing Diepsloot from the R511, Source: http://action4africa.wordpress.com/2011/06/24/the-akani-project/

Image b : showing Dainfern estates Source: http://www.chase-veritt.co.za/dainfern?type=1



Map 4: Diepsloot , Source :Demacon 2012

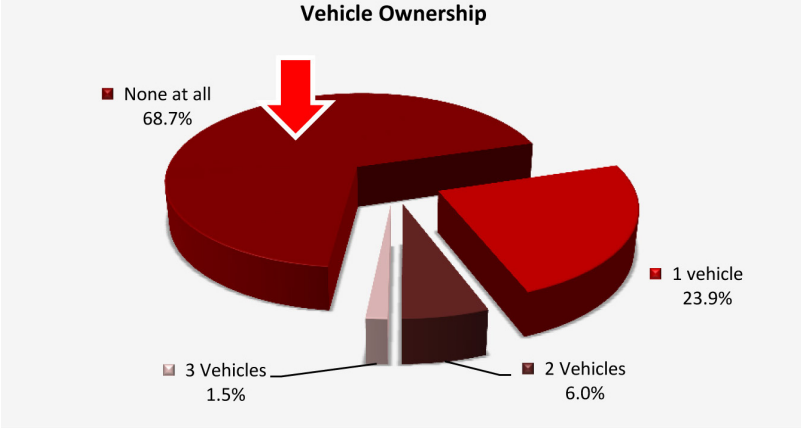


Chart 1: Showing Vehicle owenership in Diepsloot, Source Demacon, 2012

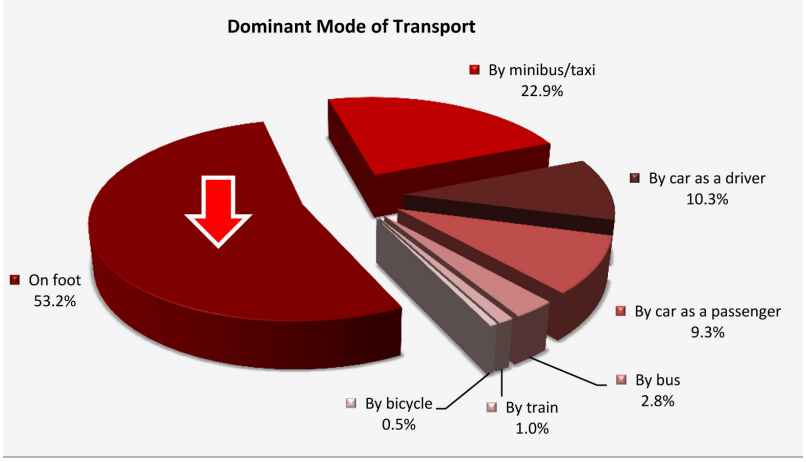


Chart 2: Showing modes of transport in Diepsloot, Source Demacon, 2012

Transport and Infrastructure

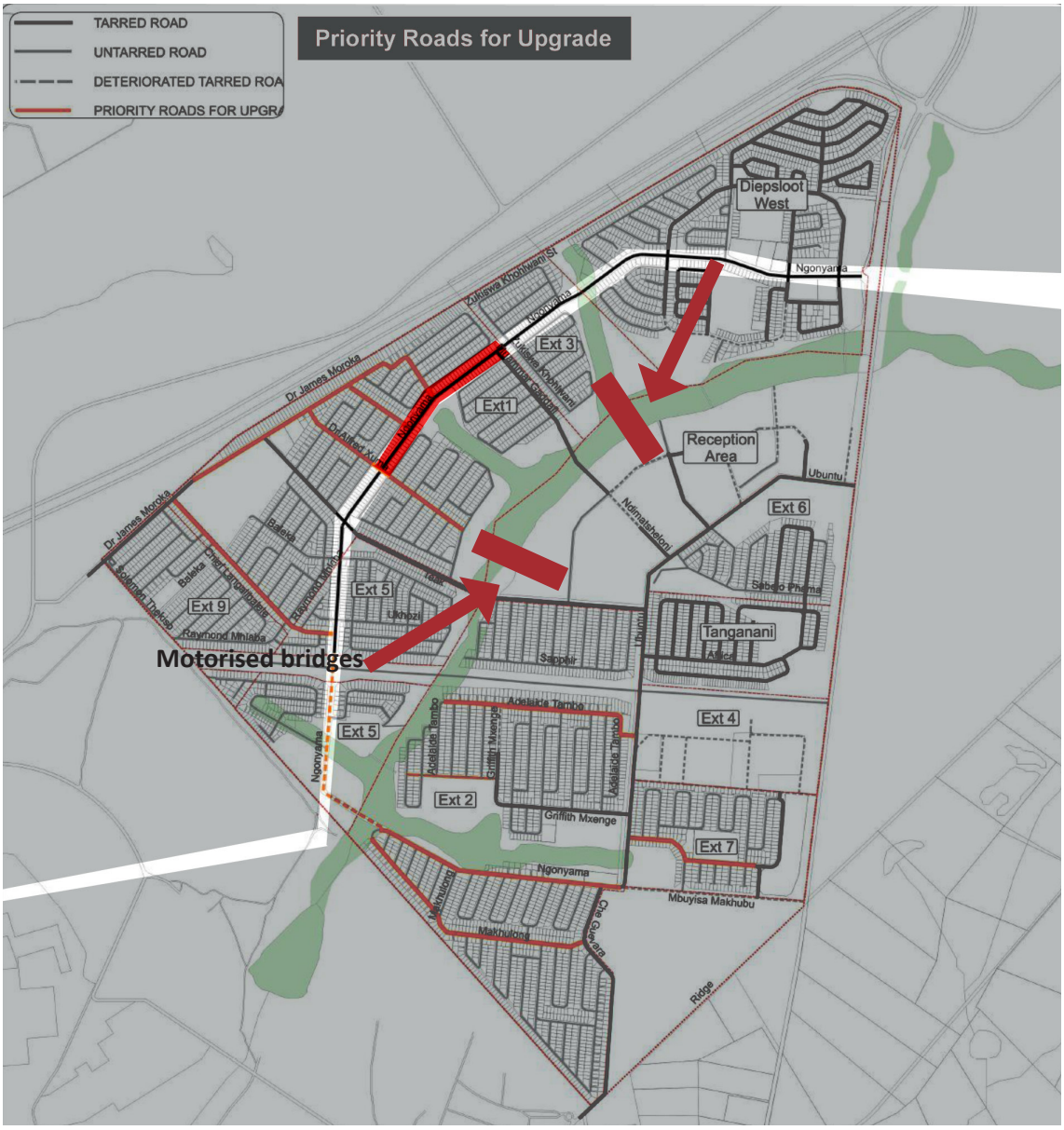
Residents of Diepsloot are heavily reliant on public transport according the survey conducted by Demacon, 2012. Only about 31.4% of the local population own cars ,as illustrated in chart 1. Chart 2 indicates the distribution of the modes of transport within the area.

It could, however, be argued that this assumption suggests that vehicle ownership will in fact remain the same, which is not necessarily true. However, responding to the current needs may give justice to the residents of Diepsloot, as large spaces of parking that characterise most retail developments may be viewed as a loss of valuable space that could have otherwise be used to address the pressing accommodation needs.

Map 5 ,illustrates the road infrastructure within the neighbourhood .It is generally poor, most of the roads are not tarred, the few roads that are tarred exist are in desperate need for upgrade with the priority roads being almost unmanageable by small vehicles as illustrated in image d.
In other parts of the settlement, they are completely insufficient as illustrated in map 6.

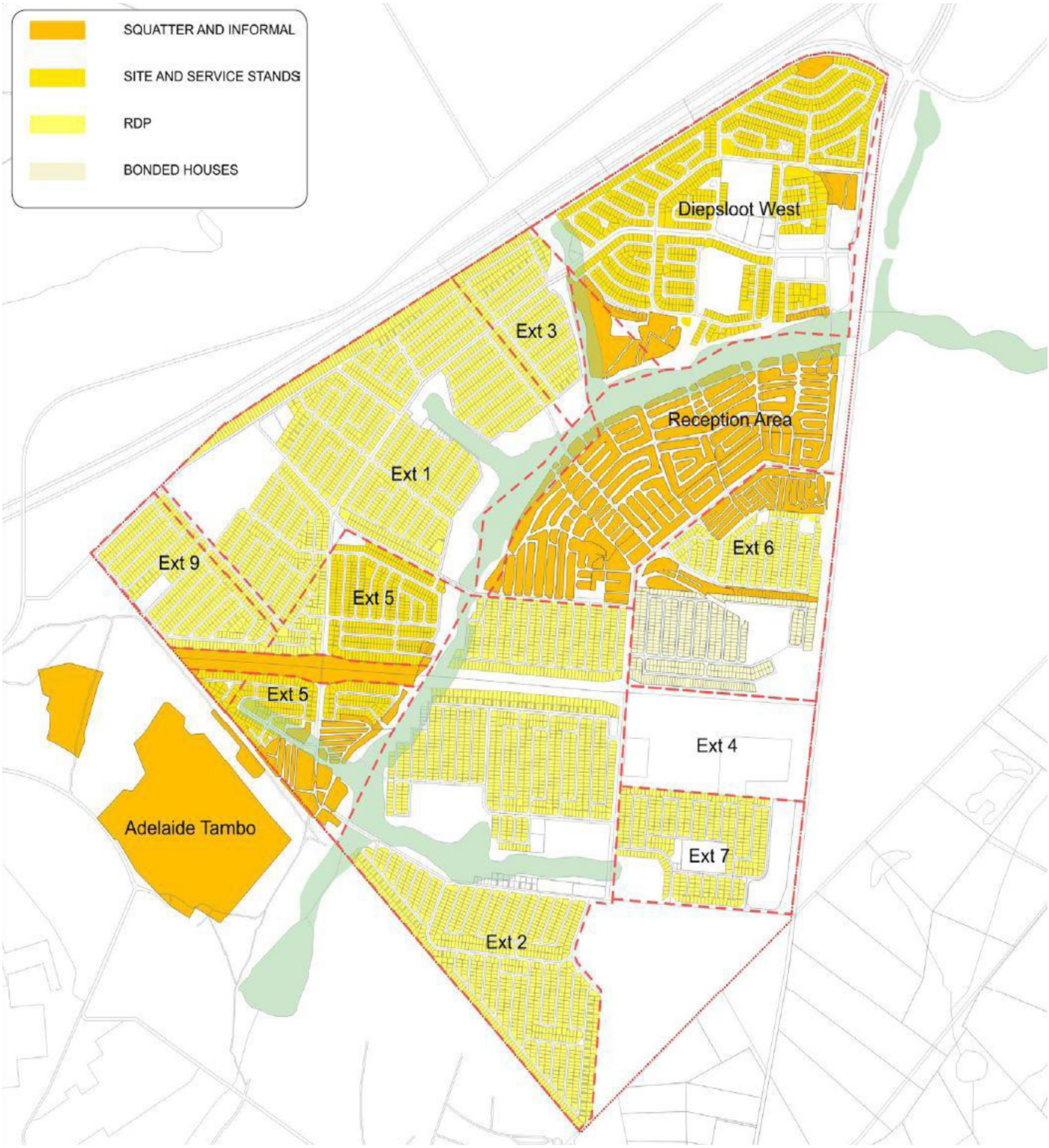
Movement between the east and west side of the settlement is limited, as there are only two connecting motorised bridges,shown in map 5, and no pedestrian bridges in the entire settlement.

Image d showing an attempt to fill up a pothole on the road
Image by Author



Map 5: Showing road infrustructure status quo ,Source JDA 2014

Map 6: Showing insufficient vertical connecting roads in the parts of the settlement



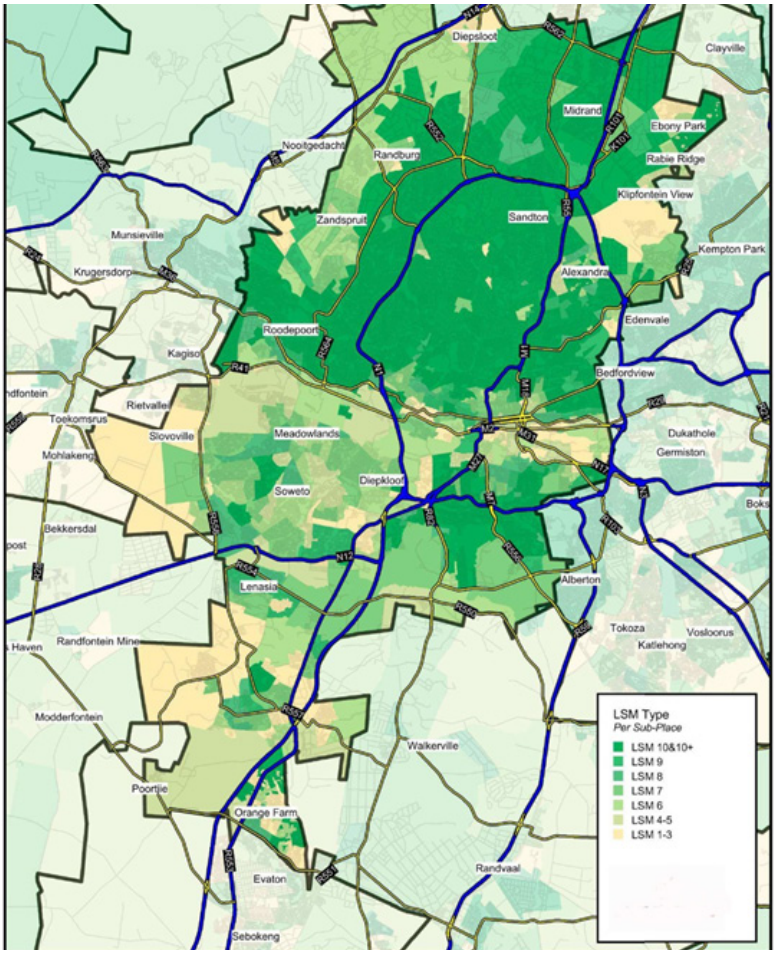
Map 7: showing housing types and distrubution, Source:Demacon,2012

Housing

RDP housing is predominant with surrounding informal dwellings on one property used mostly for rental purposes or Micro retail according to Harber 2011. Standalone informal dwellings are concentrated along the R511 side of the settlement, with Tanganani`s bonded small units south of the settlement.

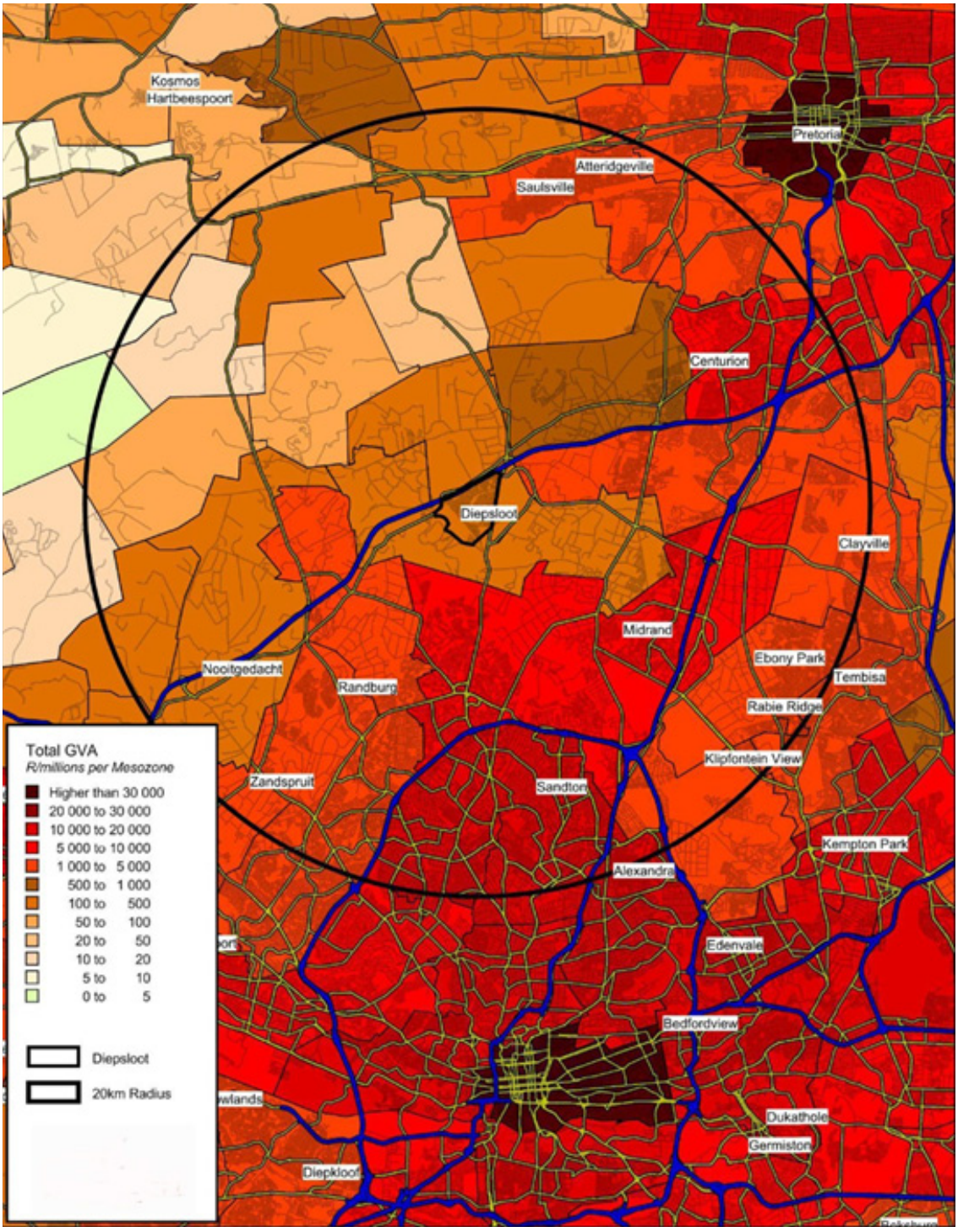
According to a study released by Demacon for the JDA, the settlement is riddled with under- employment, high density of people per square metre and due to the informal dwellings, high levels of undocumented migrants, inadequate infrastructure, under-provision of social space, few formal economic development facilities, high incidence of HIV/Aids, lack of skills, access to quality schools, access to healthy food sources and diets. Basically, this places Diepsloot in the lowest bracket of low to moderate living Standard as illustrated in Map 5.

Table 1 summarises the gathered information that forms the base point thus far and is used to highlight the information in the proposal.



Map 8: Showing LSM types Source:Demacon,2012

	Established Base point	Primary Response areas
Low to moderate living Standard This forms the backbone of the response, the project should be primarily targeted at a population with low incomes and whose basic needs are their primary goal	Un employment	the proposal should be aimed at creating more jobs in both the formal and informal sector without taking away business from the existing informal trade established in chapter 1
	Diversified population mix	A platform for social integration and cultural exchange is necessary in the fight against xenophobia
	Lack of economic development facilities	The project should aim to create a framework and provide the facilities that encourage business growth from survivalist to more sustainable Opportunist types of business with long term goals. It should aim to empower the locals with business aspirations encouraging local run macro businesses(as opposed to chain stores)
	Lack of Skills	The proposal should aim to promote skills development and host the necessary facilities that support
	Education	In the broader sense of the scheme ,facilities that supplement the existing educational framework should be provided
	Poor Health food and diets	The project should support locally grown food products to cut on food costs , improve and encourage healthy diets
	Lack Social spaces	The proposal should aim to create such spaces



Map 9: showing GVA of Diepsloot and surrounding areas. Source Demacon market studies

Economic Status quo

Diepsloot measures a GVA* on the lower end of this scale compared to most of the surrounding areas.

Demacon was able to deduce the sectors that were letting the settlement down in its GVA, by analysing its determining factors closely and quantifying them accordingly. From these they were able to highlight areas that needed attention. Of interest to this thesis are Agriculture, Community, Social & Personal Services, General Government Services, Transport, Trade and Manufacturing. These areas form the key components that will contribute to the creation of the economic node, which will be discussed in more depth in the next chapter.

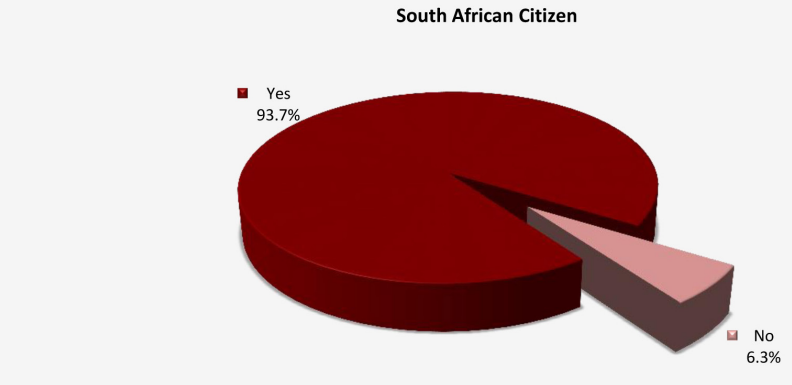


Chart 3 showing citizenship in Diepsloot, Source Demacon, 2012

Chart 4 showing unEmployment period in Diepsloot, Source Demacon, 2012

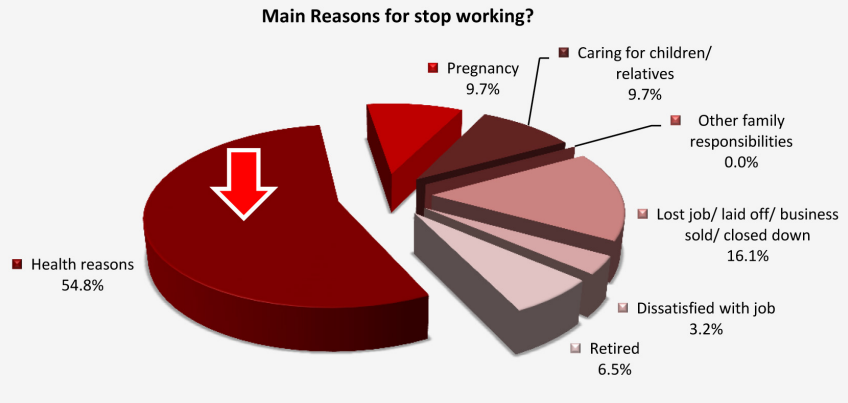


Chart 5 showing reasons of unEmployment in Diepsloot, Source Demacon, 2012

Social Status quo

It believed that of the 160 000 people living in Diepsloot, a highly understated 6.3% of them are foreigners (Demacon, 2012). Chart 1 illustrates the documented citizen profile in the area. It is difficult to document the exact figures, as they do not possess the official immigration documents, according to Harber 2011. However, from some site investigation, one can establish that there is mix of South African, Nigerians, Congolese, Somali, Malawian, Mozambique and Zimbabwean nationals. In such a population mix, an intervention is almost always fundamental in order to promote social integration. The lack of social cohesion was evidenced by the Xenophobic uprisings that were at the height in 2008. The Daily Maverick reports that although the incidents of such violent crime have subsided, "one person a week, on average, was killed, while 100 were seriously injured and over 1,000 were displaced."(Daily Maverick;Online Source)

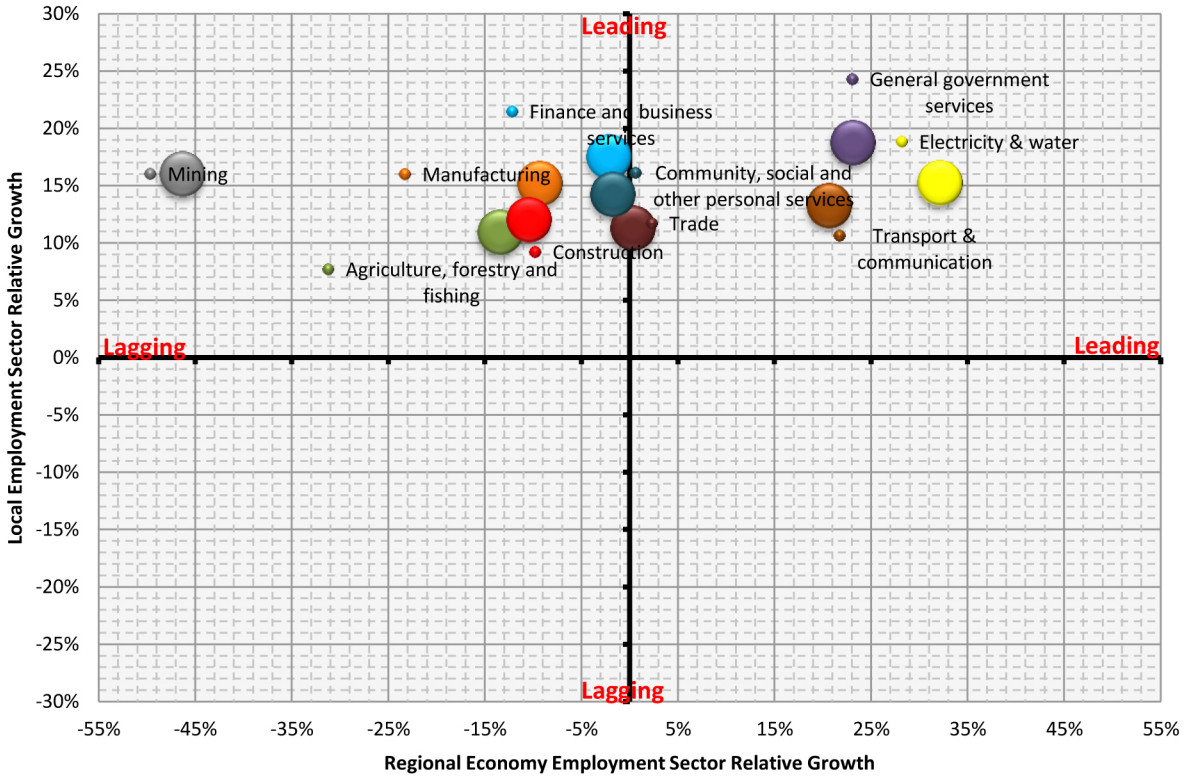


Chart 6 showing leading lagging employment segments in Diepsloot, Source Demacon, 2012

The unemployment rate, as mentioned earlier is at 53.4%. Chart 2 illustrates the periods and the lengths of time the surveyed group had gone without employment, their highest percentage have gone without employment of over 3 years!

54.8 % of the surveyed group state the reasons they stopped working are health related, as is illustrated in the Chart.

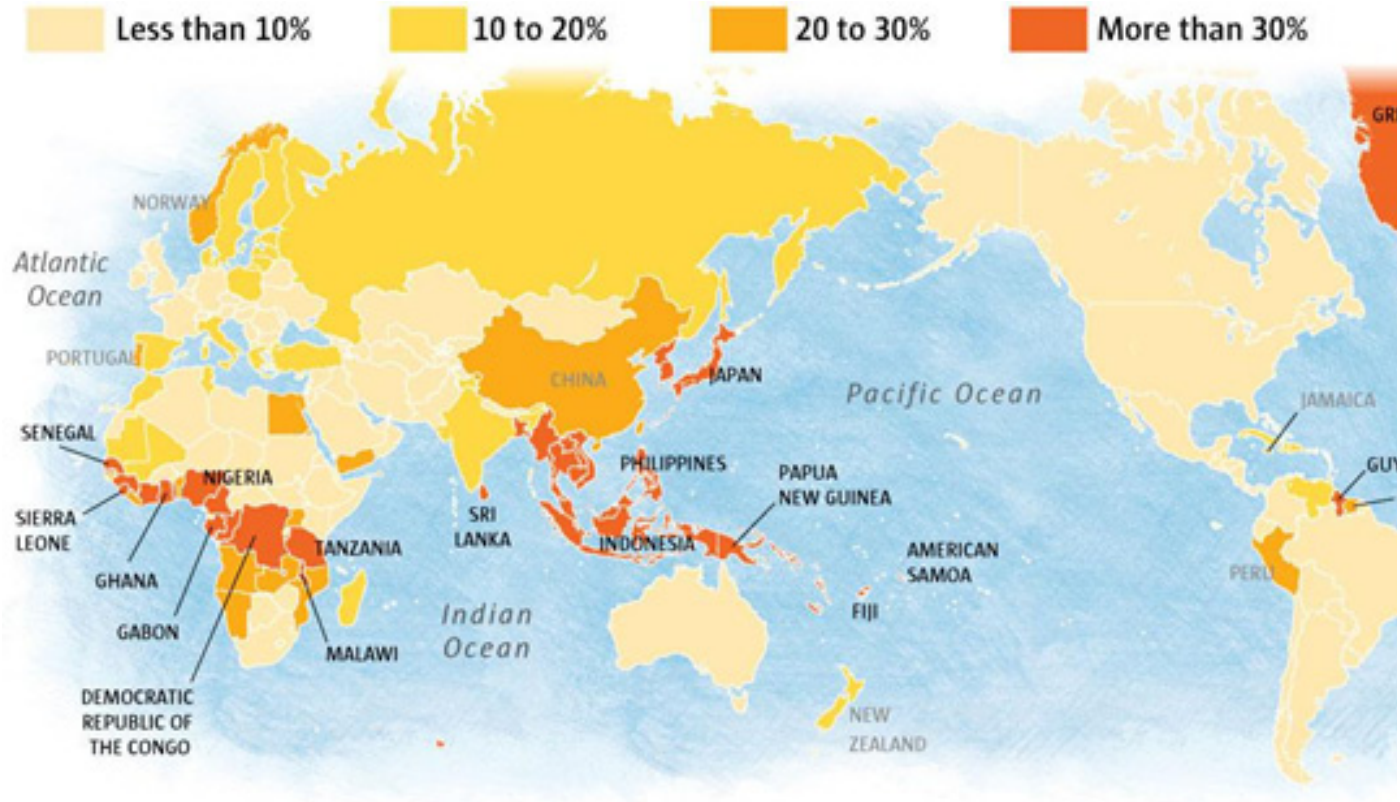
As most scientific research Nutrition md.(Online) suggests that choosing a healthy diet can reduce the risk of diseases, it can be concluded that whilst it is essential to promote social integration and address unemployment , the issue of health simply cannot be ignored, as the workforce being created must be healthy enough to take on the jobs that must be created.

An agricultural intervention is fundamental in addressing the health issues that exist in the community, as this would substantially reduce food costs , making a healthy diet more affordable to the locals. Demacon, 2012 gives further evidence that supports the need for an agricultural-based intervention,

Agriculture, forestry and fishing are documented in the Industry as lagging the most, in terms of employment growth. As illustrated in chart 4, this suggests that there is very little farming being carried out in the area. A Hybrid typology that addresses both health and retail is therefore proposed for the first phase of the vibrant economic node.

It has been found that the one protein source which is easiest to cultivate and the countries all have in common is FISH. The Philippines, Indonesia and other fish-eating countries present themselves as potential markets for export purposes at an international level, with various other African countries as regional export markets, and at entry level ,Diepsloot itself, Gauteng and the rest of South Africa.

The wetland presents itself as the perfect site for this aquaculture project and it also brings to light the possibility of contributing to the eradication of the various health and diet issues, by implementing an organic produce farm, that can serve to teach urban farming, farm commercially and contribute to the upliftment of the actual wetland. The two, complimented with educational component will increase the skills set of the residents and a culinary market will encourage the healthy exchange of balanced diet tips and cooking styles from the varied cultural backgrounds. Overall, Diepsloot can potentially become the prime spot for fresh health produce, outdoor exercise ,and unique Aqua culture and hydroponics education. Its introduction will immediately stimulate infrastructure development. The GVA for Diepsloot is expected to shoot up. Money generated from this project can be used to finance or support the new framework of value added commercial activity for instance, hardware trade could be complimented by an educational workshop where the residents are taught how to make and perfect their craft with the long term goal of starting up their own hardware lines. Clothing retail could be complimented by a fashion and fabrics school,



Map 10: showing fish eating countries, Source:http://defence.pk/threads/top-10-fish-eating-countries.275204/

a civic node could immediately follow, with a community library, rates hall and offices. Essentially the upgrade of the wetland with the introduction of the fish farm and fresh produce market will serve as the back bone or spine to Diepsloots` redevelopment.

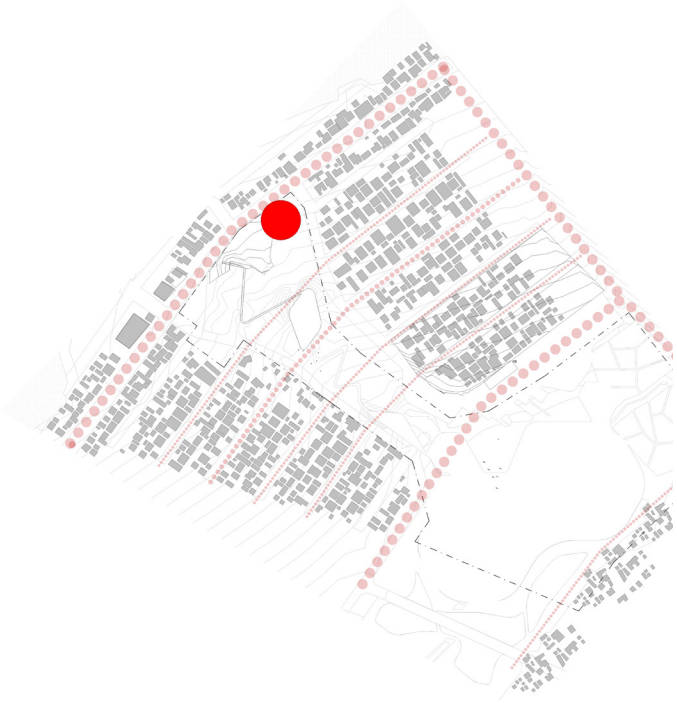


Diagram 1: showing Pedestrian movement Image by Author

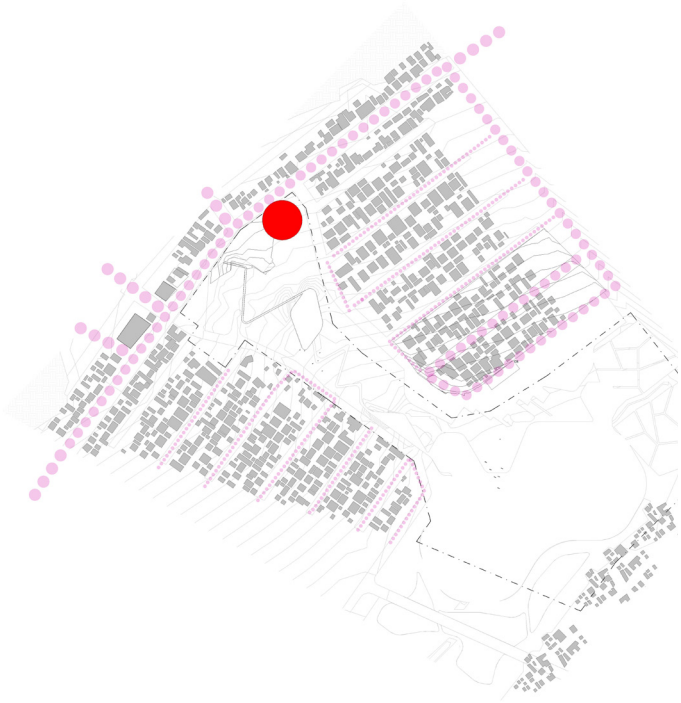


Diagram 2: showing Vehicular movement Image by Author

The Site

Map 11 represents the key public amenities within Diepsloot, of particular interest is the recycling facility number 9. This facility is less than 2 ½ kilometres from the site and will actively play the role of the primary building block supply. The Black water recycling Facility, number 10, is less than 4km from the site and will play a key role of supplementing feed and water for the aqua-culture facility.

Diagram1 illustrates the foot traffic around the site and the highest number of pedestrians is on Ngonyama Road and Ndimashiloni Road and parallel to the wetland. There is no formal infrastructure across storm-water inlet areas although tracks across the space indicate horizontal movement across the site and the possible need for a formal means of intervention.

Diagram 2 illustrates vehicular movement around the site. Ngonyama Road and Ndimashiloni Road have the highest traffic volumes. Although vehicles can cross the wetland, they tend not to, as the road is very poorly maintained and there is a large pothole, pooled with stagnant water that presents a health hazard to the residents in the vicinity. There are no direct routes that connect the blocks on either side of the site and it will be essential to create roads on either side to improve connectivity across the blocks, as well as across the wetland. An informal taxi rank on the northern part on the site is an ideal spot for a formal taxi rank to be situated in the proposed development.

The belts of green and the occurring waters pool positions will assist in the zoning and planning of the wetland, as the areas where there is water, is most likely the optimal position for the water pools.

The next Section is a photo documentary of the site. Image 1 illustrates the extent of refuse on the site, Image 2 illustrates the uncontrolled nature of the wetland and these open spaces represent the untapped potential of the site.

Image 4 illustrates the main modes of transport that need to be accommodated in the design. There are only 3 bank ATMs in the area and security around them is a concern. The scheme should highlight and accommodate banking, as its provision is insufficient.

Image 6 give an indication of the scale that already exists in the neighbourhood. The highest residential development is two stories high and could be perceived as an aspiration for larger scale within the settlement.
Image7 illustrates an unsuccessful agricultural project, clearly there is a awareness and consciousness of urban farming but it could be that the education and know-how of making a successful agricultural project is sorely lacking and this needs to be addressed in the planning of the project.

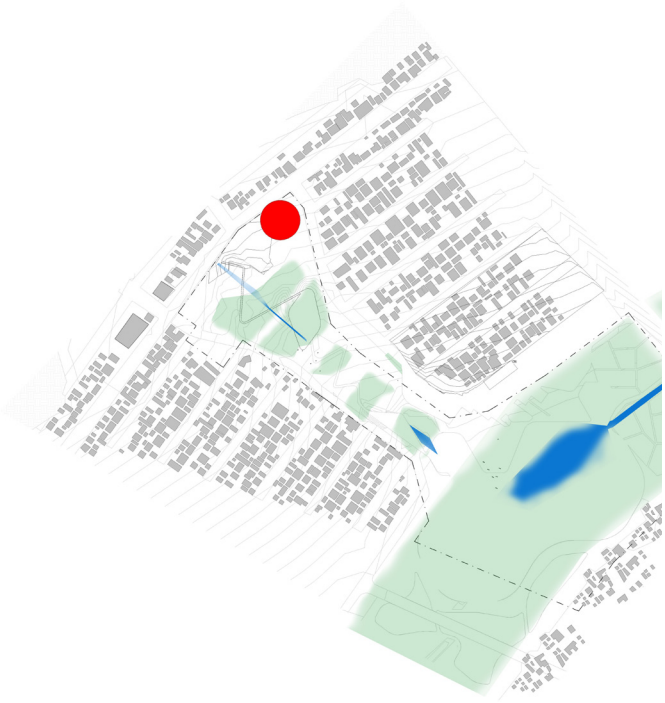
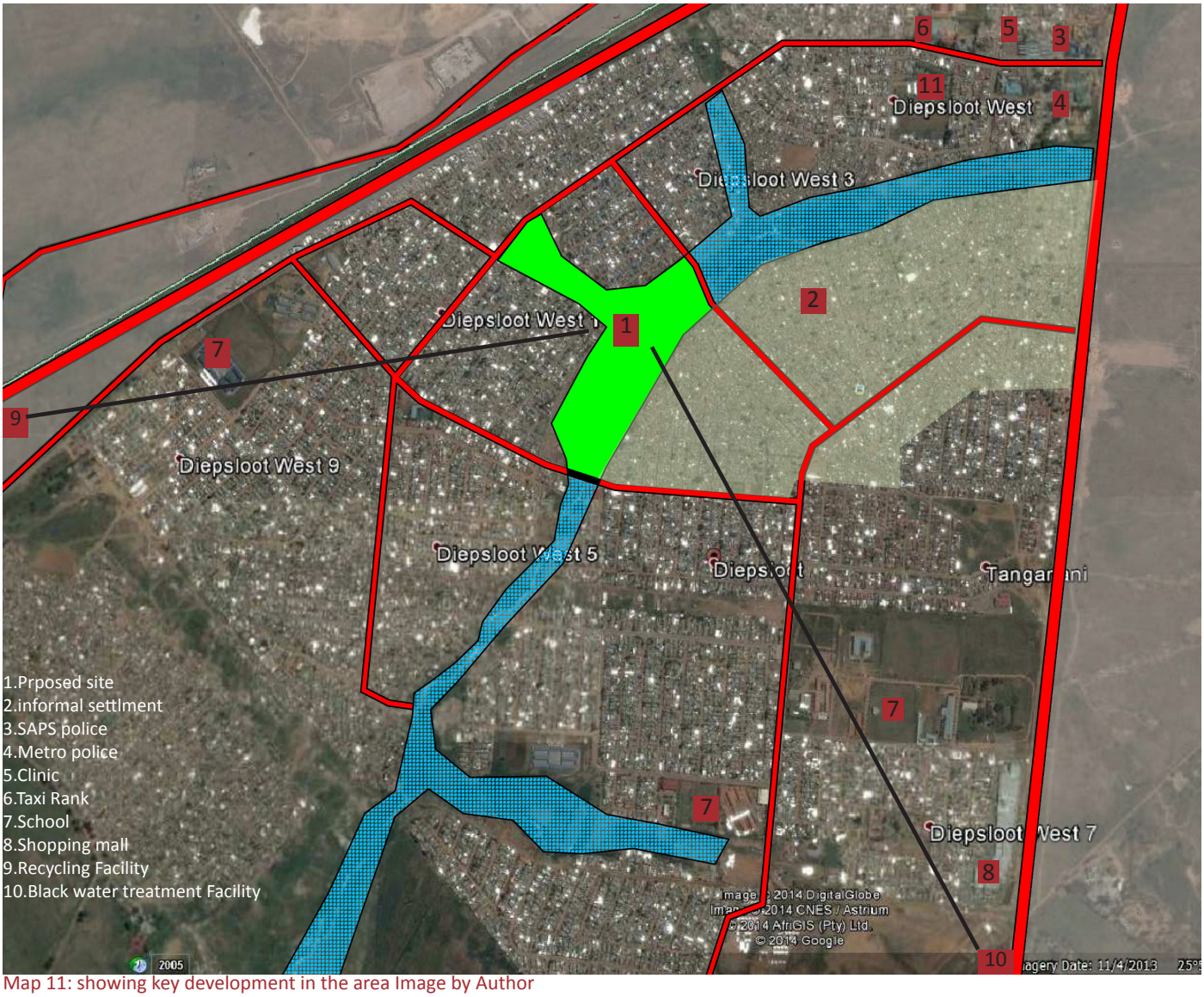


Diagram 3: showingwetland Image by Author

Image showing pothole on Ndimashiloni Image by Author



Map 11: showing key development in the area Image by Author


1


2


3

LEGEND

1. Extent of Refuse
2. Wetland
3. Unportected Water Body
4. Transport Modes
5. ATM
6. 2 Storey House
7. Attempt at Gardening

All images by Author

WATER HANDLING

URGENT NEED TO ADDRESS SANITATION

1. Project Brief
2. Problem Statement
3. Project Aims and Objectives
4. Design Proposal
5. The User
6. The Client

CHAPTER 03

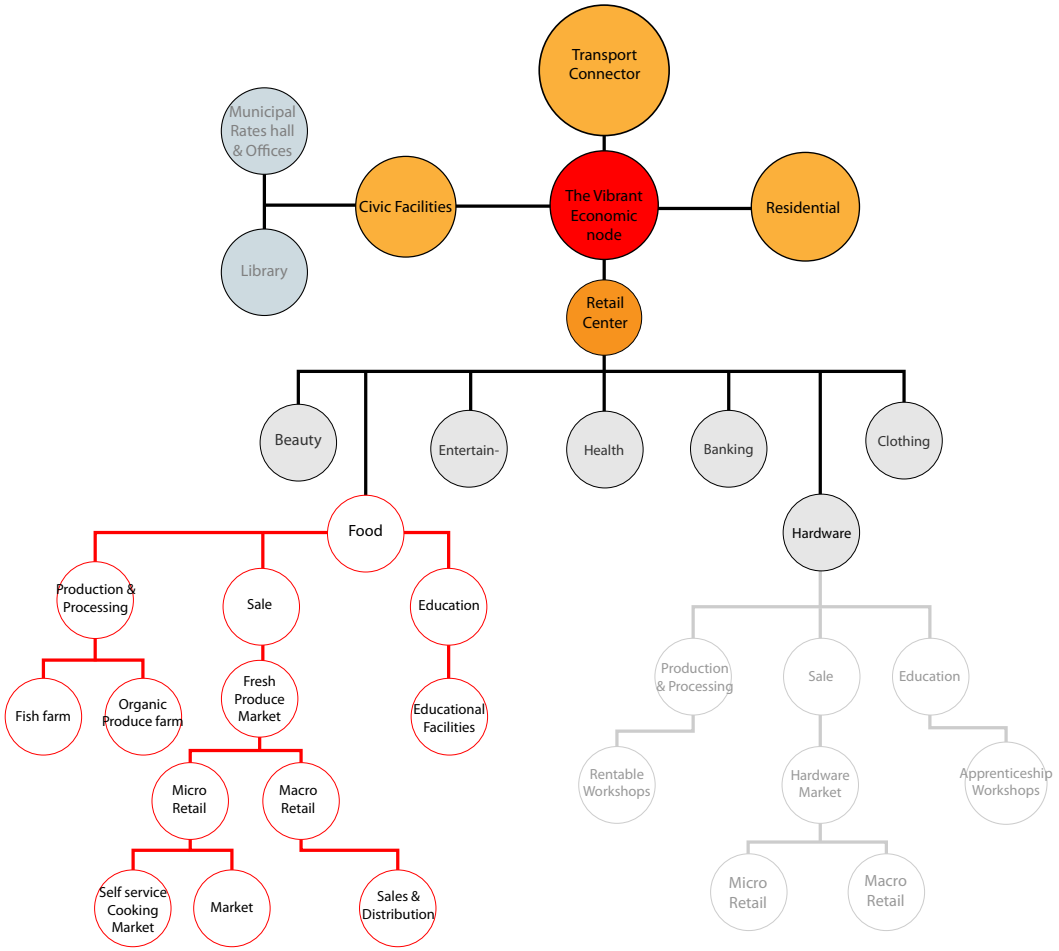


Chart 1: showing The Vibrant Economic Node
Chart by Author

Project Brief

This project attempts to develop a design intervention that creates employment opportunities for both small businessmen and medium to large businessmen, whilst contributing to the development of new skills set in the community of the informal settlement of Diepsloot, Johannesburg, South Africa. The Scheme should act a catalyst for social integration and growth, and, in addition, the design should address the ecological issues as well as the well-being and livelihoods of the community.

The design should function as an originator, promoting the following:

- Provide a framework from which further development will follow
- Facilitate improved infrastructure and services
- Establish a connection between the built environment and social cohesion
- Provide a platform for improved social and cultural interaction and the general well -being of individuals
- Establish community pride through the built form itself, restoring dignity of space
- Defining recreational and public space

Problem statement

The lack of skills, skills development, self-empowerment, public amenities and looming health hazards should be addressed with appropriate design intervention.

Research aims and objectives

- Investigate how macro retail can adapt within an informal settlement, whilst supporting the growth of local businessmen
- Establish a typology as a precursor
- Investigate a closed loop or zero waste system
- Design energy efficient systems
- Reduce dependency on off-site energy sources
- Investigate cost effective ways of recovering a wetland

Project Aims and Objectives

- Provide a stimulus for economic growth
- Establish civic presence
- Create a building that serves as a symbol of renewed hope and support

Design proposal

The broad design intervention is towards the creation of a vibrant economic node within the informal settlement of Diepsloot.

This node will consist of:

- Retail centre
- Civic facilities
- Light industrial
- Transport connection
- Residential component

Image 1: showing Proposed Wetland Redevelopment
Diagram by Author

•Agricultural & Ecological component
Chart 1 gives an illustration of the holistic scheme.

This development node will promptly improve infrastructure development as earlier mentioned in the document and illustrated in diagram 1, showing improved vehicular connectivity between the area previously divided by the wetland and vertically along both sides of the site.

Pedestrian connectivity, as illustrated in diagram 2 and image 1, across the storm water treatment area is aimed at creating a spine that is not only improving accessibility within the economic node points, but also fills in the missing link between the streets across the treatment facility, positively contributing to the foot count through the retail establishments.

Images 2 and 3 illustrate the pedestrian experience through the routes across the storm water treatment park of the wetland. A new tree-lined boulevard across the wetland past the water bodies function not only as an amenity, but also as a tranquil area of recreational activity such as exercise, play and meditation space as illustrated in image 4.

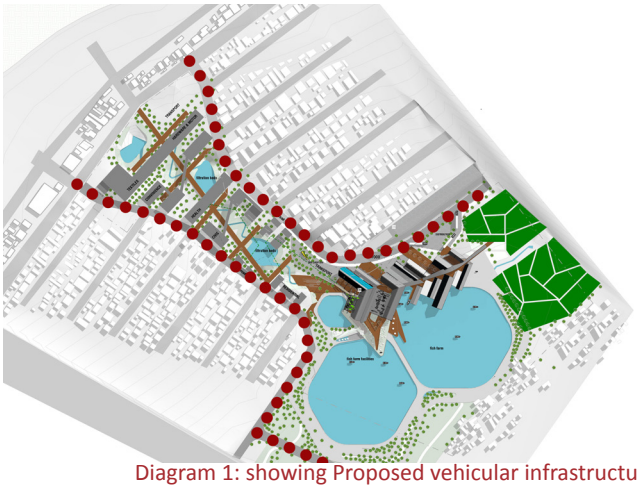


Diagram 1: showing Proposed vehicular infrastructure
Diagram by Author

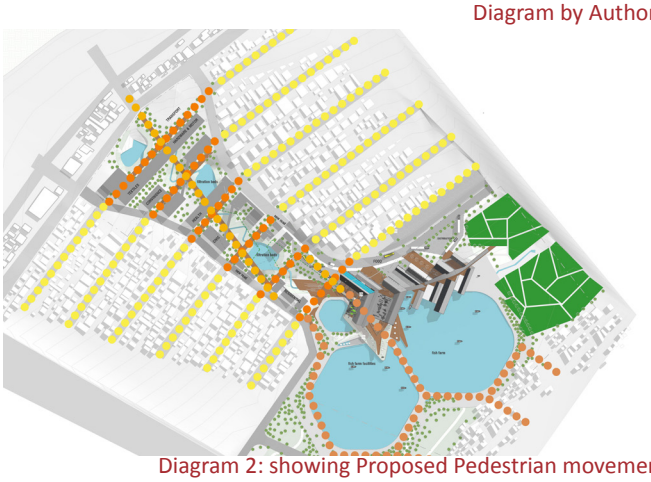
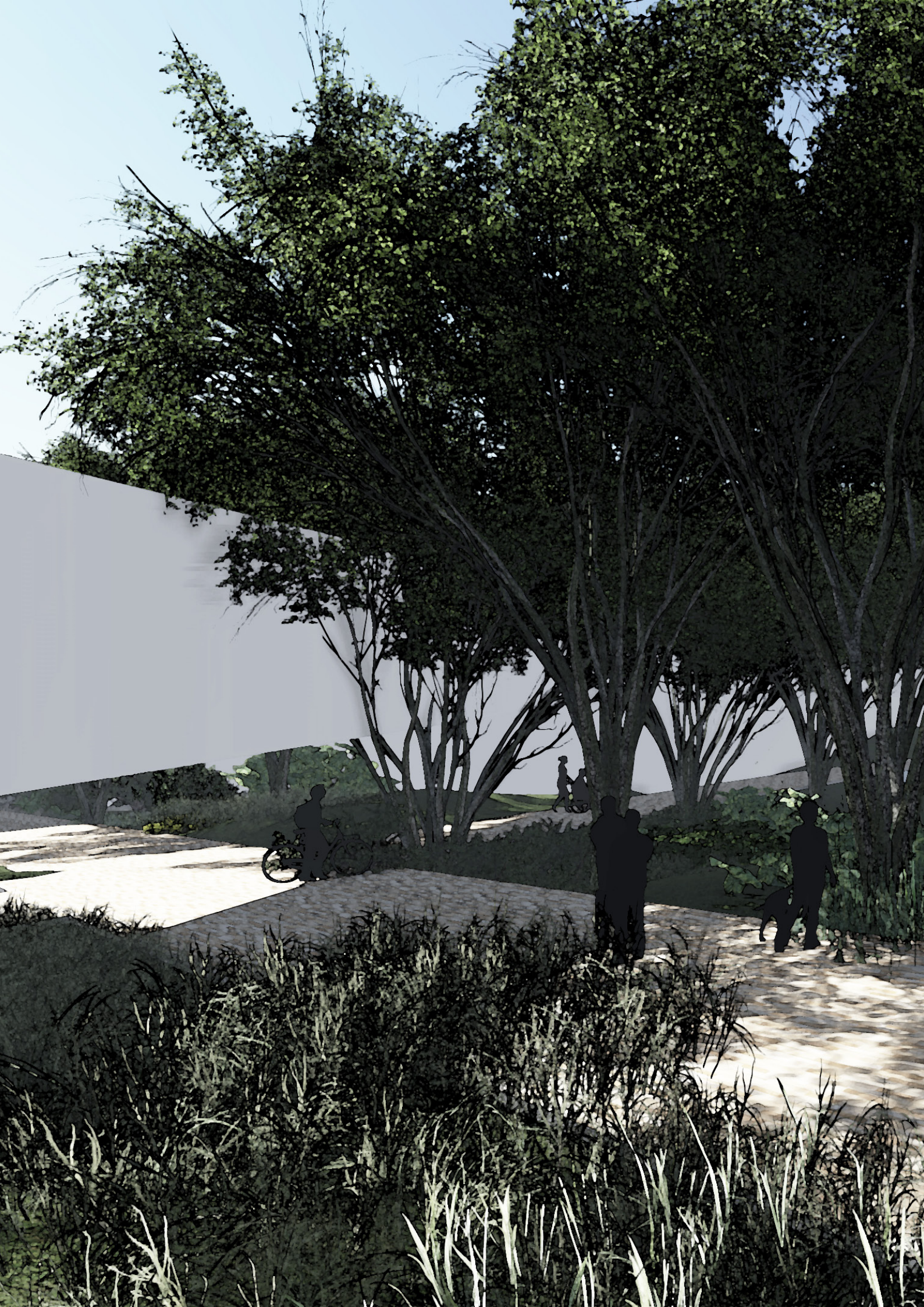


Diagram 2: showing Proposed Pedestrian movement
Diagram by Author



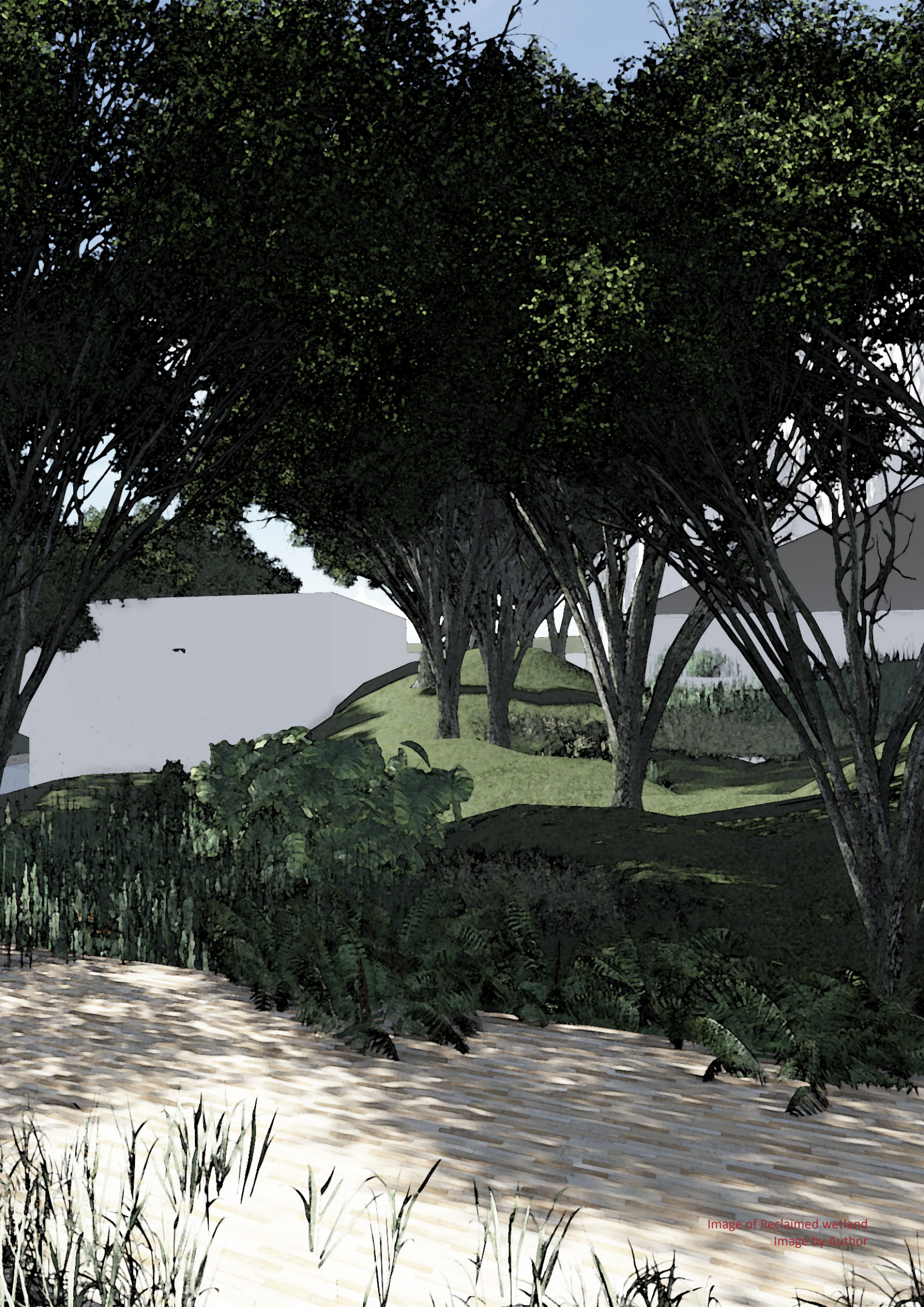


Image of Reclaimed wetland
Image by Author

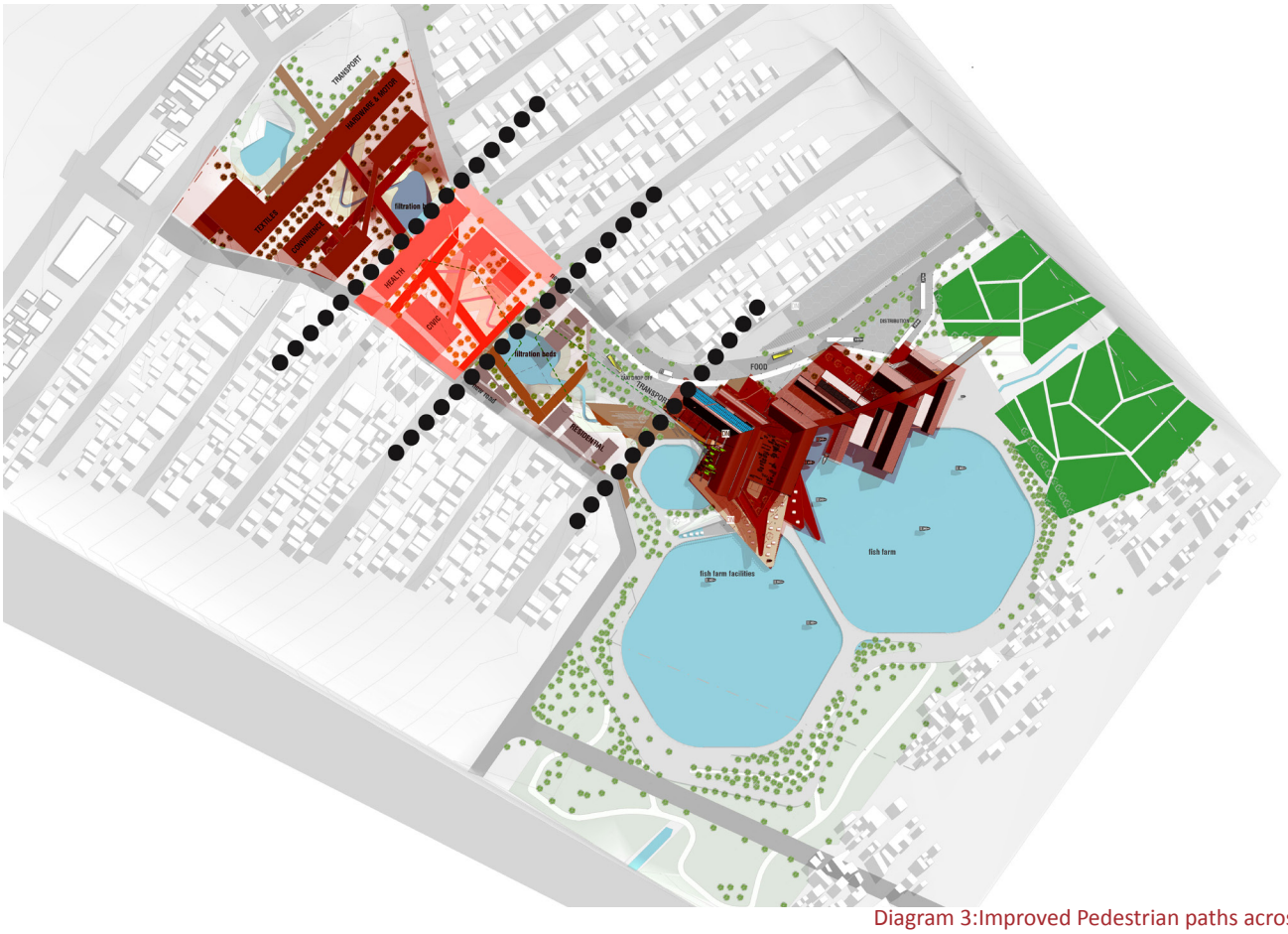


Diagram 3:Improved Pedestrian paths across wetland
Image by Author

These improved networks of pedestrian pathways link and hold the proposed node within a park-like environment, that allows the storm water treatment lung to serve its primary functional needs elaborated later on in the document and also aim to create a serene ambience for the retail, production, civic and educational facilities.

In principle, the retail centre components illustrated earlier in chart 2 are always accompanied by the light industrial component that has an added educational component relevant to it .

This combination aimed at job, skills and entrepreneurial development. These are in turn supplemented by civic facilities alongside a residential component to house the displaced residents currently dwelling in the wetland, Illustrated in chart 3.

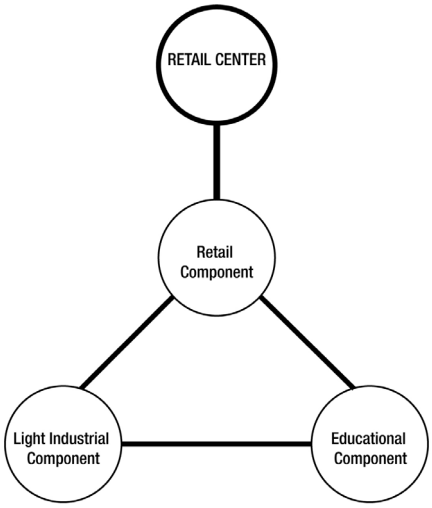


Chart 2:Retail Centre Component
Chart by Author

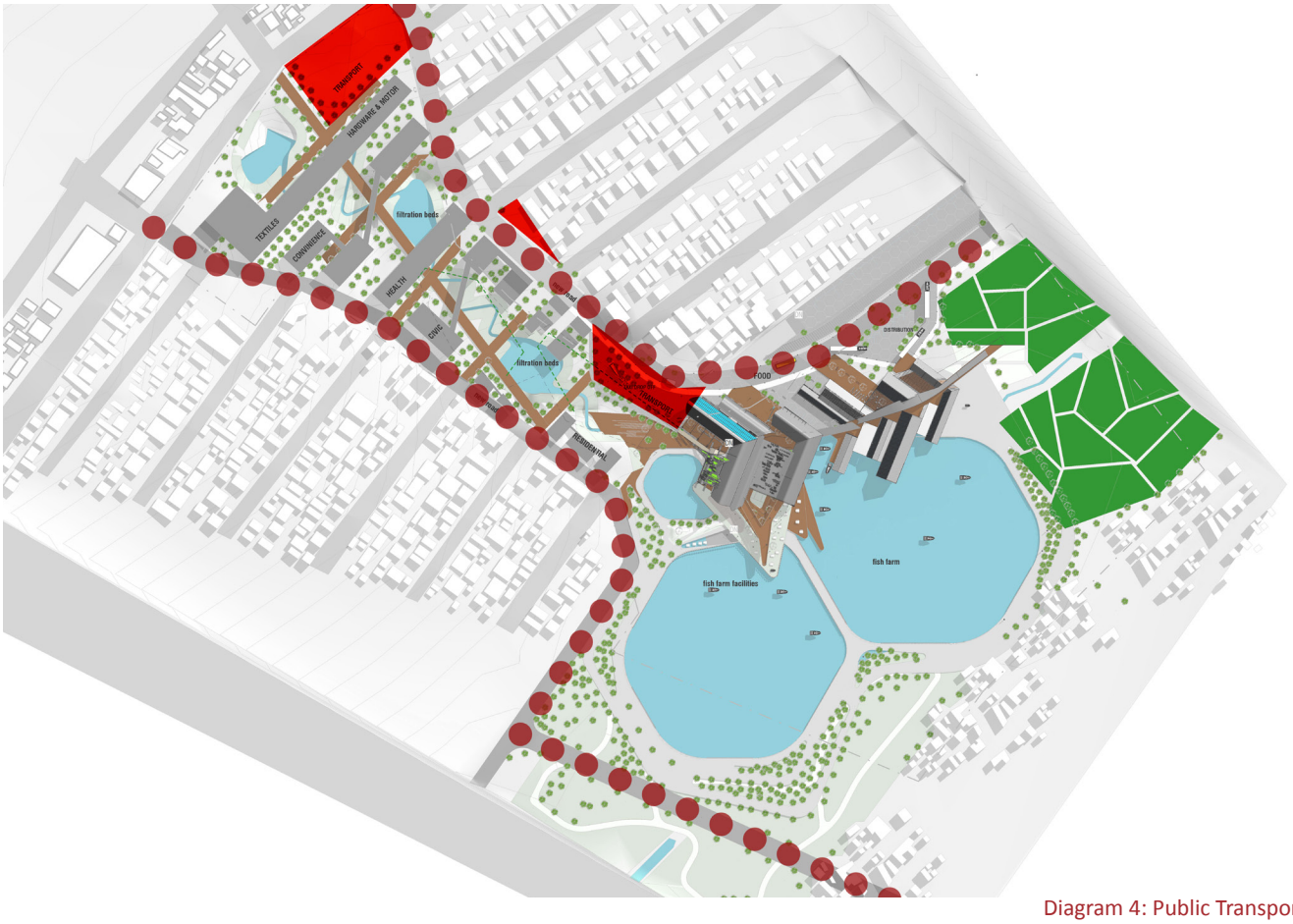


Diagram 4: Public Transport Nodes
Diagram by Author

On site, as illustrated in Diagram 3, the civic and residential components are centrally located between the retail centre scheme, aimed at encouraging a constant interaction between foot traffic and the development, which is fundamental to the success of the retail centre.

Public transport nodes, illustrated in diagram 4, are positioned long the busy side of the development and are aimed at making the development highly accessible and more convenient to the users of the establishment and surrounding areas.

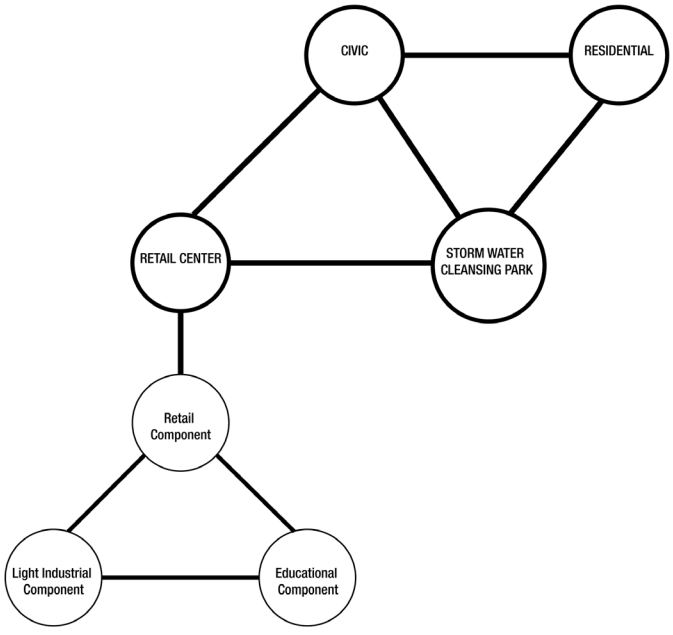
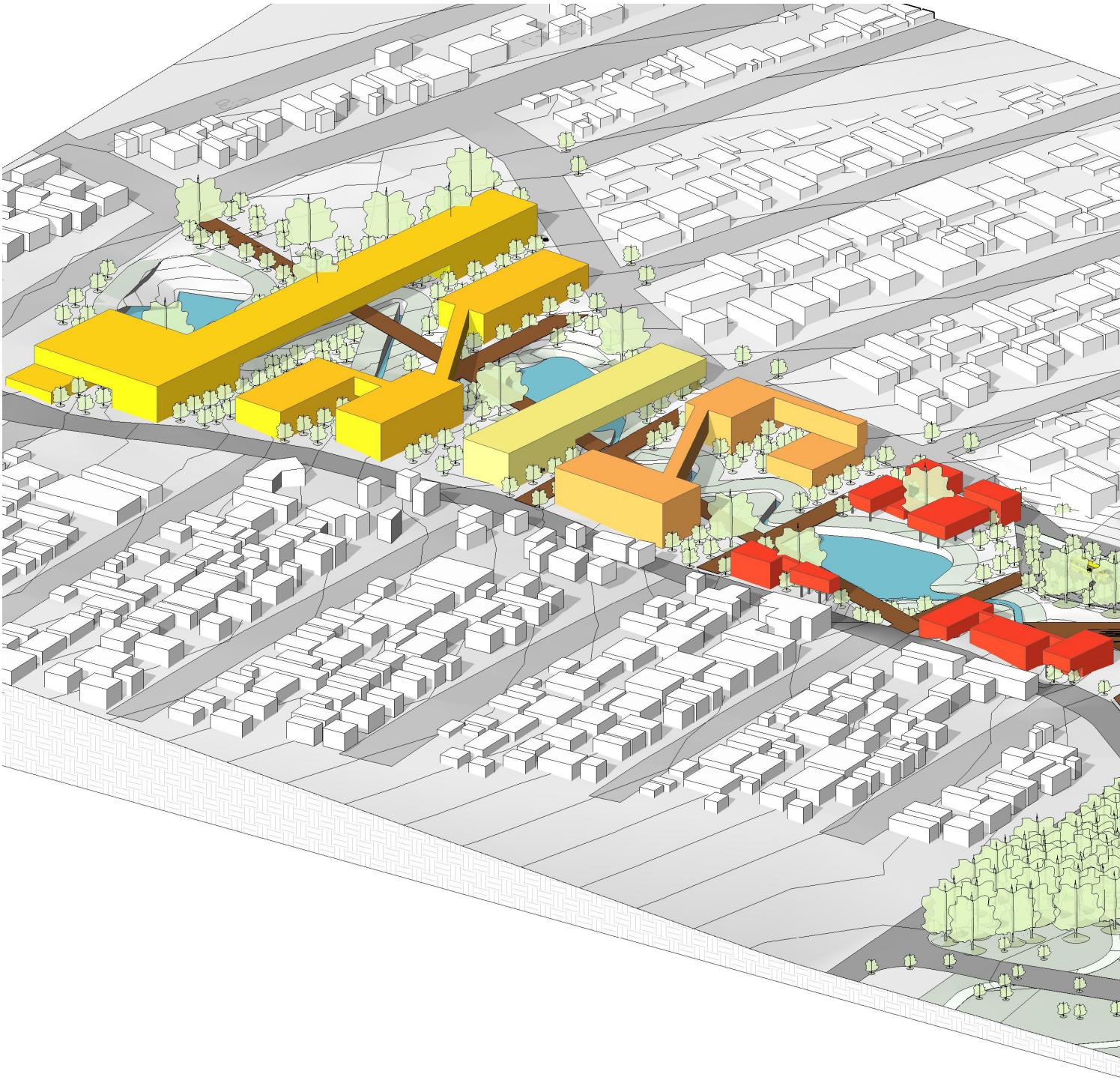
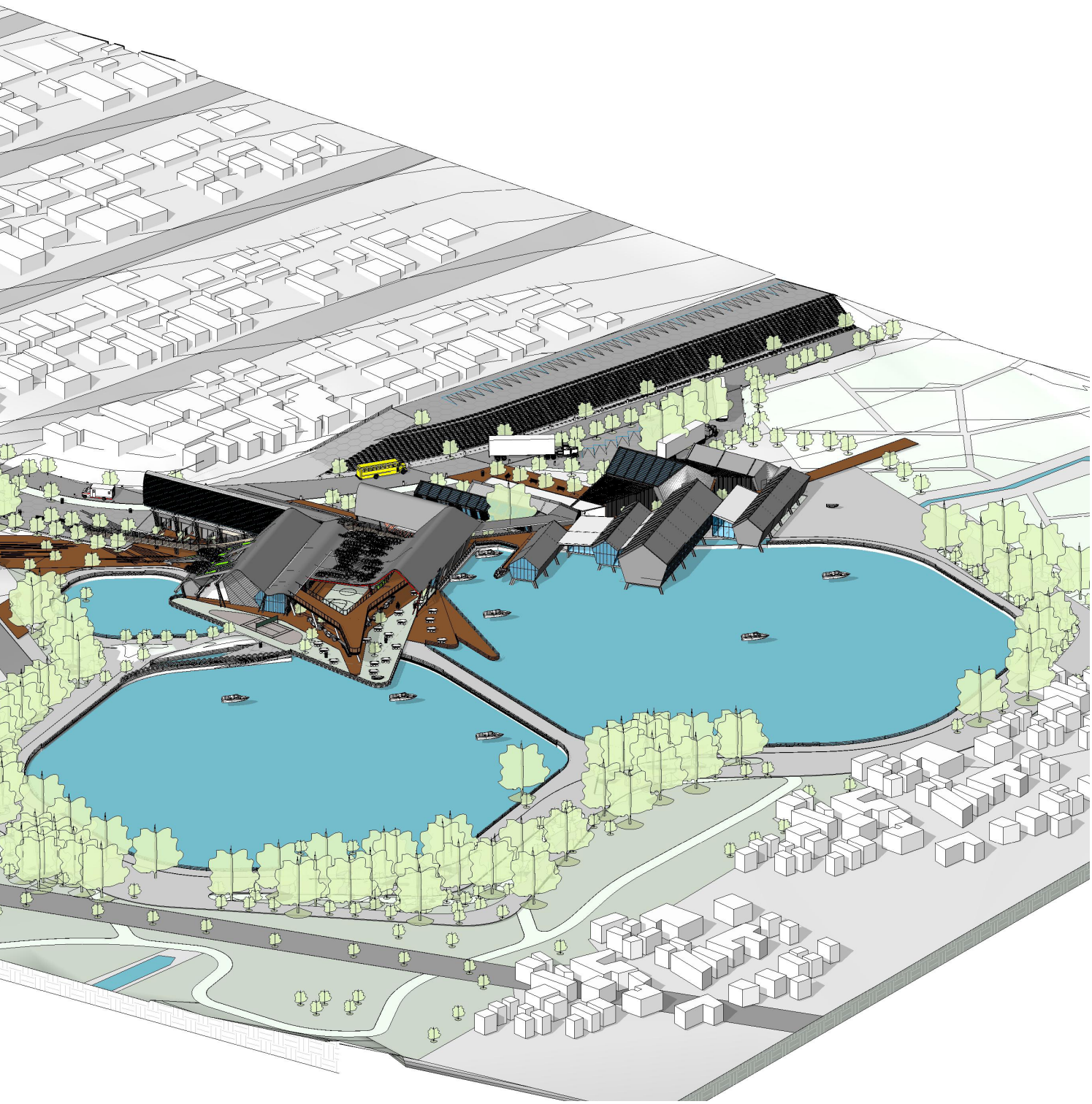


Chart 3:links
Chart by Author



The development take on a fragmented nature that is of a user friendly scale, relating to the existing scale, but also establishes a presence within a tranquil park-like environment, as illustrated in image above



This thesis will, however, propose this development as a phased development. It selects one aspect of the retail centre and proposes a design intervention discussed in the next section.

The design Intervention:

The design intervention within the informal settlement of Diepsloot should serve as a prototype that provides for the integration of small and medium to large business endeavours, that work together to improve both themselves and their surroundings. The intervention should set a precedent for the nature of future development within the retail centre framework. It should largely provide for the ecological recovery, enhancement and yield economic growth. The intervention is a Fish Farm and Organic Fresh Produce Market that provides for both the production and processing, retail, educational, culinary and recreational places of escape within the informal settlement. The educational component will increase the skills set of the residents and a culinary market will encourage the healthy exchange of balanced diet tips and cooking styles from the varied cultural backgrounds.

Overall , Diepsloot can potentially become the prime spot for fresh health produce, outdoor exercise and unique Aqua-culture and hydroponics education. This introduction is aimed at stimulating infrastructure development. The GVA for Diepsloot is expected to rise.

Funds generated from this project can be used to finance or support the new framework of value added commercial activity within the retail centre framework, and , as illustrated in the Chart , hardware trade could be complimented by an educational or apprenticeship workshop, where the residents are taught how to create and perfect their craft, with the long-term goal of starting up their own hardware lines. Clothing retail could be complimented by a fashion and fabrics school, a civic node could immediately follow, with a community library, rates hall and offices. Essentially, the upgrade of the wetland with the introduction of the Fish Farm and Fresh Produce Market will serve as the backbone or spine to Diepsloot's redevelopment and upliftment.

The User:

- Community
- Business owner
- Small Retailer
- Organic produce lovers
- Fresh Produce wholesalers
- Aqua Culture Stuff
- Organic garden produce

The Client:

The Department of Trade and Industry (DTI) 2014, is committed to the development that promotes enterprise growth, self-empowerment and equity within the economy. This makes the DTI an ideal client for the development of the Micro retail component of the development.
The DTI in 2013, also launched an Aquaculture Development and Enhancement programme. Trade and Industry Minister Rob Davies is quoted in on an online newsletter (SA business;Online) stating "South Africa only contributes about 1% of Africa's aqua-culture production. This launch today can be used as an opportunity to grow the Sector in the next few years to remain competitive globally." He went on to announce the DTI's commitment to invest in machinery, equipment, bulk infrastructure, land and buildings which will include hatcheries, production, processing and preserving the infrastructure that supports aqua-culture in South Africa. This aim is to also contribute to food security, job creation and skills development , as well as foreign currency.







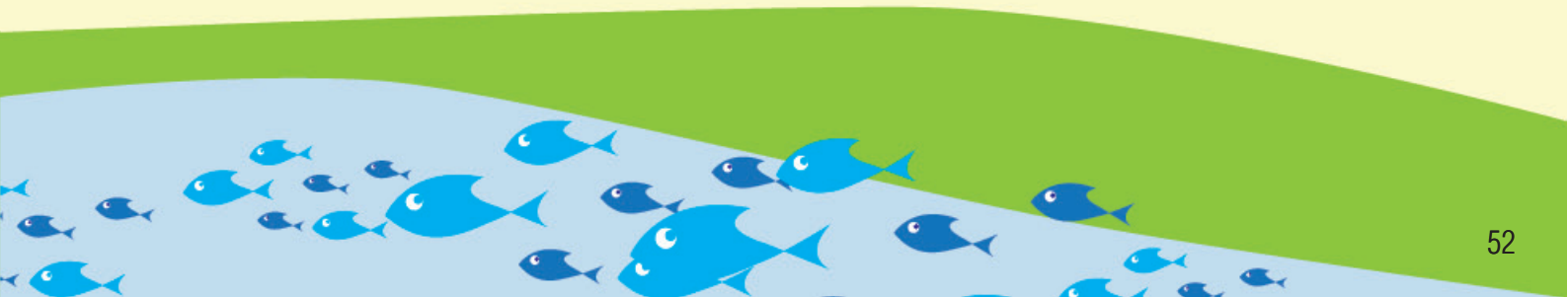

TECHNOLOGY

BUILDING INNOVATION

In this chapter, various technologies that address the wetland design as well as the building design will be explored . Sustainability through the use of recycled materials in unique building technologies will be the key driver in this section.

1. Sustainability
2. The Ecological Wetland System
3. How a Storm Water Wetland Works
4. Wetland Fish Pond Construction
5. The Ecological Recycling System (Aquaponics)
6. Case Study: Commercial Aquaponics in South Africa
7. Case Study 2: Aquaponics Elsewhere in Africa, Kenya
8. The Building Thermal Controls
9. The Fish Ponds
10. Fish Processing
11. Recycled Bottle Technologies
12. Reused Tyres Technology
13. Flotation Device Technologies

CHAPTER 04



Recreational spaces, Source: http://www.bae.ncsu.edu/stormwater/PublicationFiles/SWwetlands2000.pdfAccecced 18 Sep. 14

6

Sustainability

Various components of the project will be examined individually, with findings being translated into design tools that will be implemented in the built form design. The main objective is the emphasis on cost effective methods, by means of reuse of waste and training and the use of local labour, thereby setting a precedent for new alternative means of construction.

1: The Ecological Wetland System

The primary aim of upgrading the wetland is to produce fresh water that can be used as a raw material for the fish farm. However, benefits of designing a wetland according to a study conducted by the University of North Carolina that have greatly benefited the state include its improved local climate, beautiful and environmentally diverse landscapes. The treatment of wetlands into drier land frees up property for lucrative waterfront development according to the North Carolina study,2006. Such developments would fundamentally assist in the maintenance and upkeep of the development which would significantly contribute to the viability of such a project.

A Well-functioning Storm water wetlands is defined as a diverse ecosystem that supports plant and animal species, it removes both solid, nutrient, bacteria and chemical pollutants from the runoff water. They significantly improve the quality of water, assist in flood control, create wildlife habitats and offer the platform of education and recreational spaces.

Diepsloot`s wetland upgrade would benefit the community by:

- Assisting in flood control
- Creating drier land that can be used for Commercial purposes
- Cleaning and improving water quality
- Creating Recreation and educational areas
- Improving the ecosystems and creating new habitats for wild life
- Creating employment for locals e.g. through services in maintenance & infrastructure upgrade

Image 1 to 5 illustrate the current conditions of Diepsloot wetland .

1. image showing poorly maintained wetland in Diepsloot, used as a dumping site
2. image showing conditions of foot paths close to the wetland
3. Diepsloot during flood time(Source, http://dailysun.mobi/news/read/4393/rain-chaos)
4. Rubble dumping on wetland
5. Condition of streets leeding to wetland

Images by Author

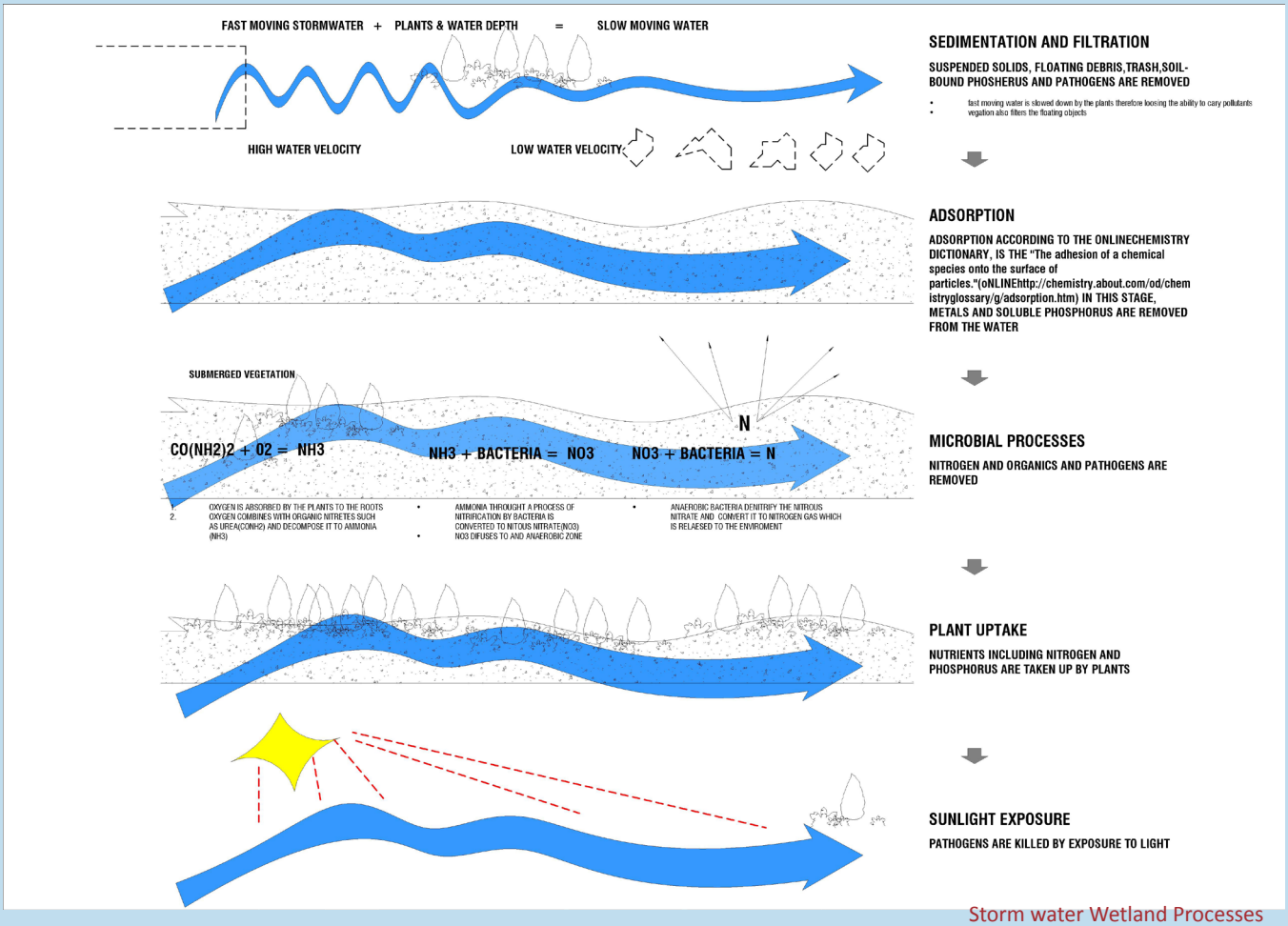

1


2


3


4


5



Storm water Wetland Processes
Source: Author

How a Storm water wetland works

Storm water wetlands are specialised systems that focus on removing sediment, metals, nutrients, chemicals and bacteria. The mechanisms illustrated above, involved include Sedimentation, filtration, adsorption, de-nitrification , plant uptake and sun exposure. The processes of the mechanisms are explained in the diagram above.

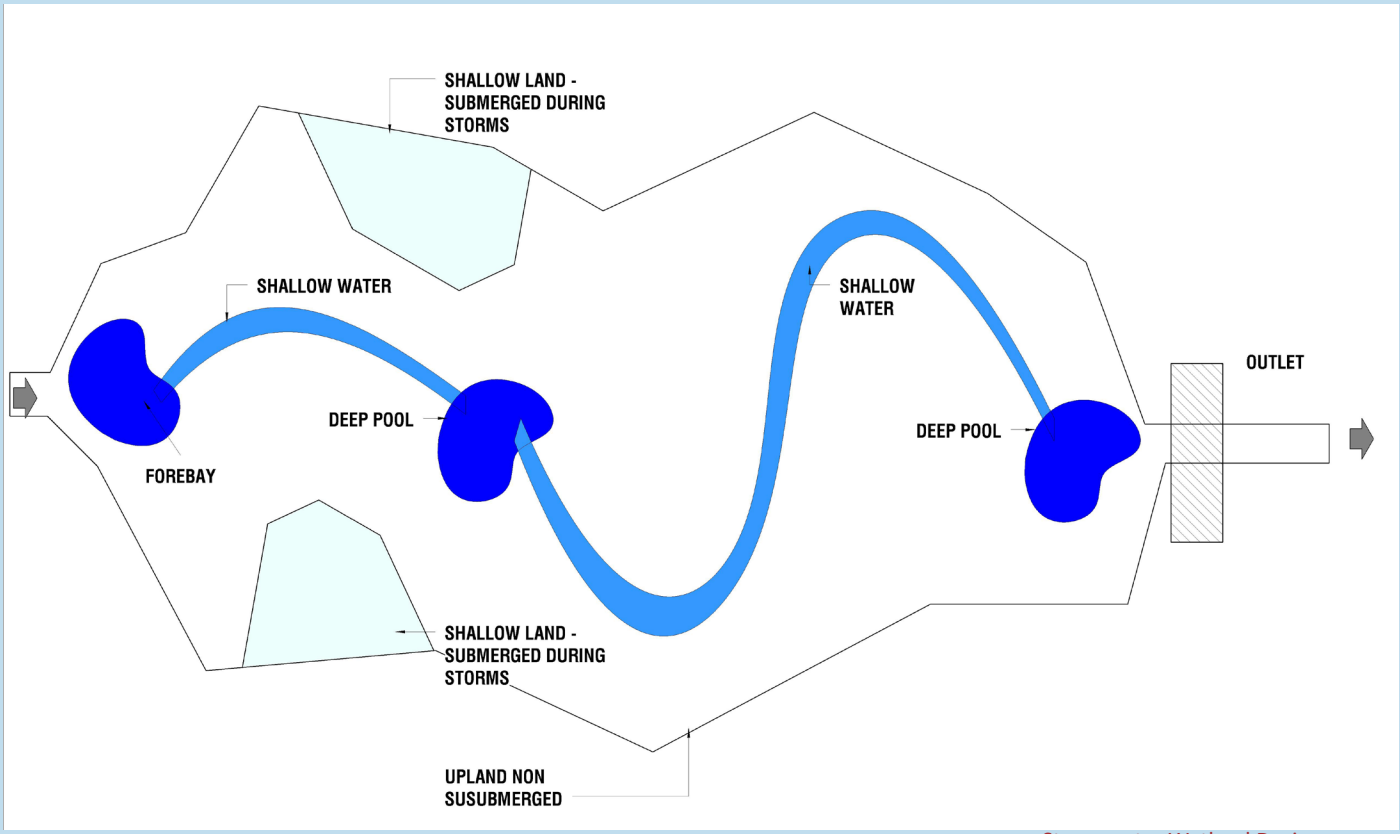
According to research done by the University of North Carolina, storm water wetlands are the most effective means of removing pollutants from storm water, compared to other practices such as ponds, sand filters and bio-retention areas. This fact is said to be accountable for the benefits that a wetland offers. Recommended wetland features as documented by North Carolina University are illustrated in the diagram below.
Common features in storm water wetlands include forebays, deep pools, shallow water areas that only become submerged during storms and areas that do not ever flood as retention devices.

This flow path is designed to improve the treatment of storm water, increase storm water retention time and prevent short-circuiting of the system.(SWwetlands, Online). Forebays are placed at the beginning of the wetland, where the run-off enters for the first time; sedimentation occurs in this area and requirements are:

- This pool is at least a meter deep.
- The forebay should be easily accessible to heavy equipment for litter and sediment removal purposes
- This pool is to be maintained more regularly than others to ensure efficient water treatment
- 10% the size of the wetland is said to be the most efficient surface area for this pool according to the UNC online report.

Deep pools are essential for water treatments that meant for fish support. They require;

- Minimum 1m depth
- Water retention design that caters for drought seasons
- Less vegetation, preferred species are water lilies
- Fish for mosquito control,
- Minimum diameter of surface area is 2m.



Storm water Wetland Design
Source: Author

The Shallow Land area only becomes submerged during storms, although it is typically dry. This area must:

•Have a depth between 0 and 300mm above the normal pool area
•Have varied terrain and vegetation which allows for a wider variety of animals hence mosquito predators
•Surface area to be 40% of the wetland.

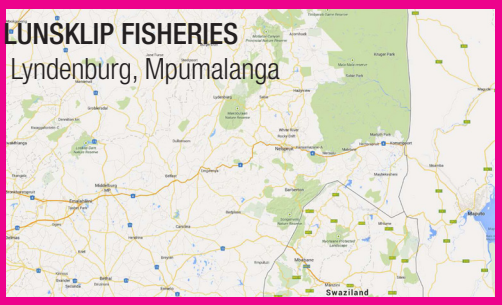
The non-floodable upland areas is designed to never become submerged, it facilitates educational and recreational facilities and possibly rentable land. A larger variety of trees and shrubs can be planted in these areas:
•The areas are between 1 and 2meters above the normal pool
Outlets control the passage of water and are designed to retain water and release excess water during storms. The spillways, are best constructed out of concrete. The retention device must be constructed so that the water level never rises above the top during a storm; a deep pool precedes it upstream

A network of pipes should be constructed throughout the wetland to allow total drainage of the water for maintenance purposes.

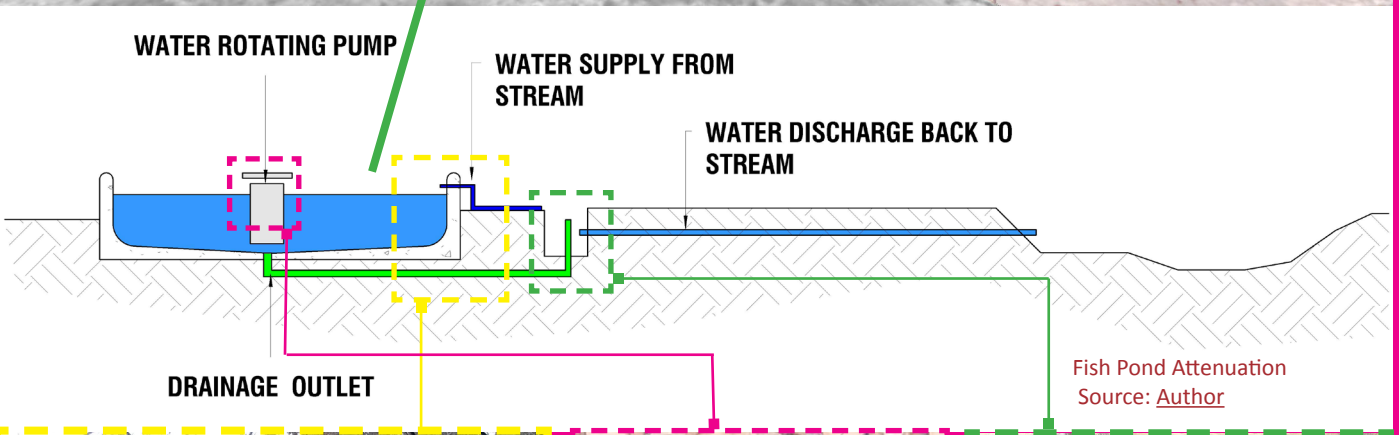
The outlet then allows water to flow to the fish farm ponds through a network of pipes. Lunsklip Fisheries in Lyndenburg, Mpumalanga illustrated below, is used as a case study to highlight how the system works.

Wetland fish pond construction

Fresh water is diverted from its natural path into a reservoir pond, each time the reservoir water level recedes. This water is then piped to the required facility, using gravity to the ponds where it is piped from the top to increase the amount of oxygen in the water. This is then circulated using a pump that is in the centre of the pool of water, also adding oxygen and preventing the water from becoming stagnant. After a predefined time period, the water is then drained from the bottom of the fish ponds to an initial pipe outlet that allows the water to fountain up, and rises to the outlet pipe level whereby it gets piped back into the natural water channel. The water fountaining process allows any unresolved solids to settle at the bottom of the channel to prevent pollution of the stream.



Site Plan
Source: Google earth

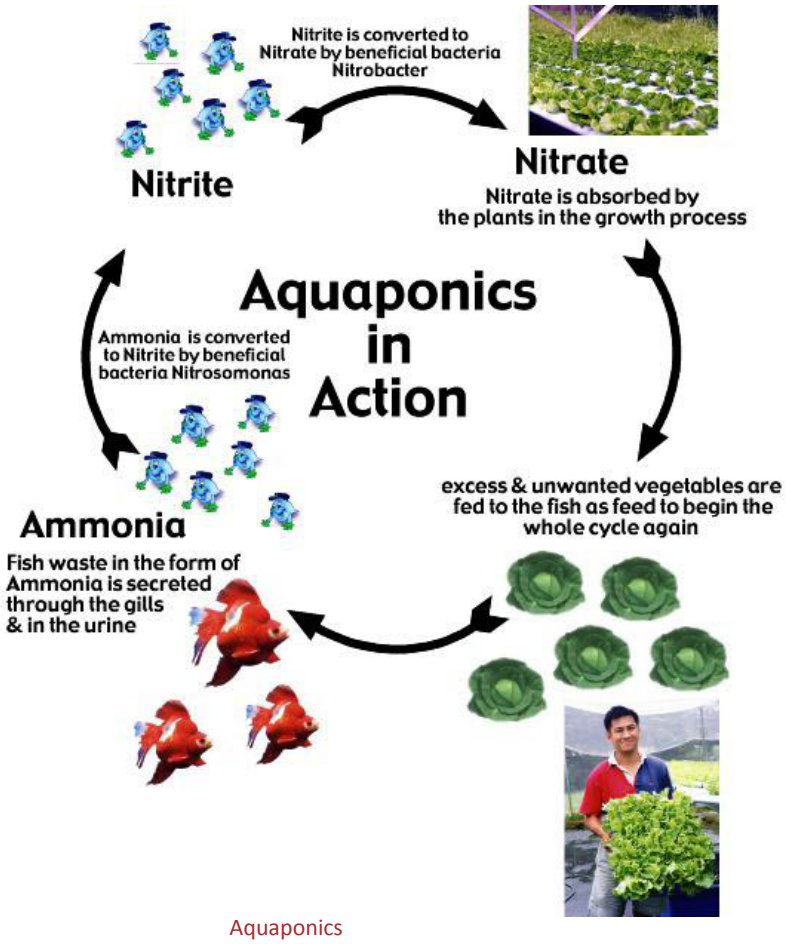


Fish Pond Attenuation
Source: Author

Typical Pond
Source: Author

Water Rotating Pump
Source: Author

Fish Pond Primary Discharge
Source: Author



Aquaponics
Source: online, http://www.beslter.org/virtual_tour/Nitrate.htm

2: The Ecological recycling system(Aquaponics)

Ammonia is essential for plant nutrition, as it assists in tissue development, building the immune system and the development to produce seeds according to the Baltimore Ecosystem study(online, Baltimore University). Fish excrete ammonia and this can be cycled to irrigate plants in a system known as Hydroponics. The combination of Aqua-culture (Growth of fish in controlled conditions) and Hydroponics is known as Aquaponics, Diver,2006. Aquaponics is considered as a means of sustainable food production as:

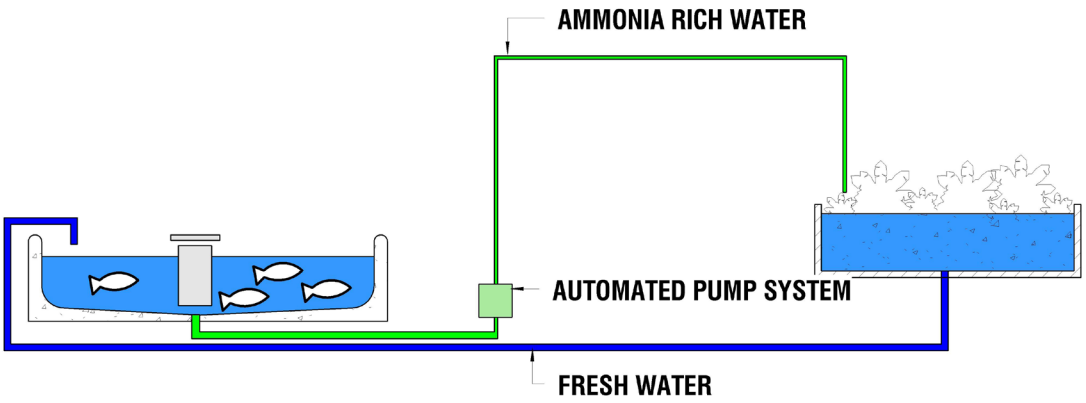
- Waste products of one biological system serve as the nutrients for another system
- The integration of fish and plants results in a poly-culture that increases diversity and yields multiple products
- Water can be reused through biological filtration and re-circulation
- Local food production provides access to healthy foods and enhances the local economy (Online Baltimore University)
- In Aquaponics, nutrients from fish manure, algae, and decomposing fish feed serves as liquid fertiliser to hydroponically grow plants. The plants strip the liquid of ammonia, nitrates and phosphorus, making the freshly cleansed water available for recycling back to the ponds.

Case Study: Commercial Aquaponics in South Africa

Leslie Ter Morshuizen is reported to be the first South African to practice Aquaponics at a commercial level in South Africa in 2013 according to Farmers Weekly magazine. According to Ter Morshuizen, the right choice of crop, “high value high turnover,” (online,farmers weekly) one can operate a highly profitable business. He backs up his findings with an experiment he conducted, in which he produced 3kg of basil from one crop bed and from this he was able to project that 40 beds would be able to generate an income of R14 000.00 a month at the price of R120/kg.

Cost implications

- Erection of aquaponic tunnel system-R350 000.00
- Low running and maintenance costs
- Power requirements where 1,62Kw of electricity
- 3,3kW heat pump for winter water heating



Fish Pond Attenuation
Source: Author

Recycling System

Water is pumped continuously through the recycling system from the fish tanks through the plant grow beds. The plants are said to remove the solid and dissolved waste, i.e. the nitrates and phosphates and then the clean water is circulated back to the fish tanks. Ter Morshuizen breeds tilapia (Oreochromis mossambicus) in his onsite hatchery, after a month he stocks the fish at 660 per 4300l fish tank which insures adequate waste is produced to sustain 2.8m2 grow beds. Temperature is said to be an important factor, he highlights that an average temperature of 30 degrees is ideal for optimum yield in crop production and makes use of heat pumps to maintain this temperature. Organic means of pest control such as garlic, chilli or khaki bush spray are used as pesticides would poison the fish.

Ter Morshuizen goes on to highlight that aquaponic farms are best located in peri-urban areas where there is an existing market in place ready to buy them. This suggests that Diepsloot would be an ideal location for such a project, as the market already exists. A marketplace would make the project even more successful, as it formalises the venue and allows for the opportunity to create a prime organic fresh produce location.

The monthly income of R4 000.00 per 100kg of fish and R14 000.00 per 100kg of organic fresh produce renders the project as a commercially viable one, according to Ter Morshuizen, 2013.

The thermal controls
The fish ponds

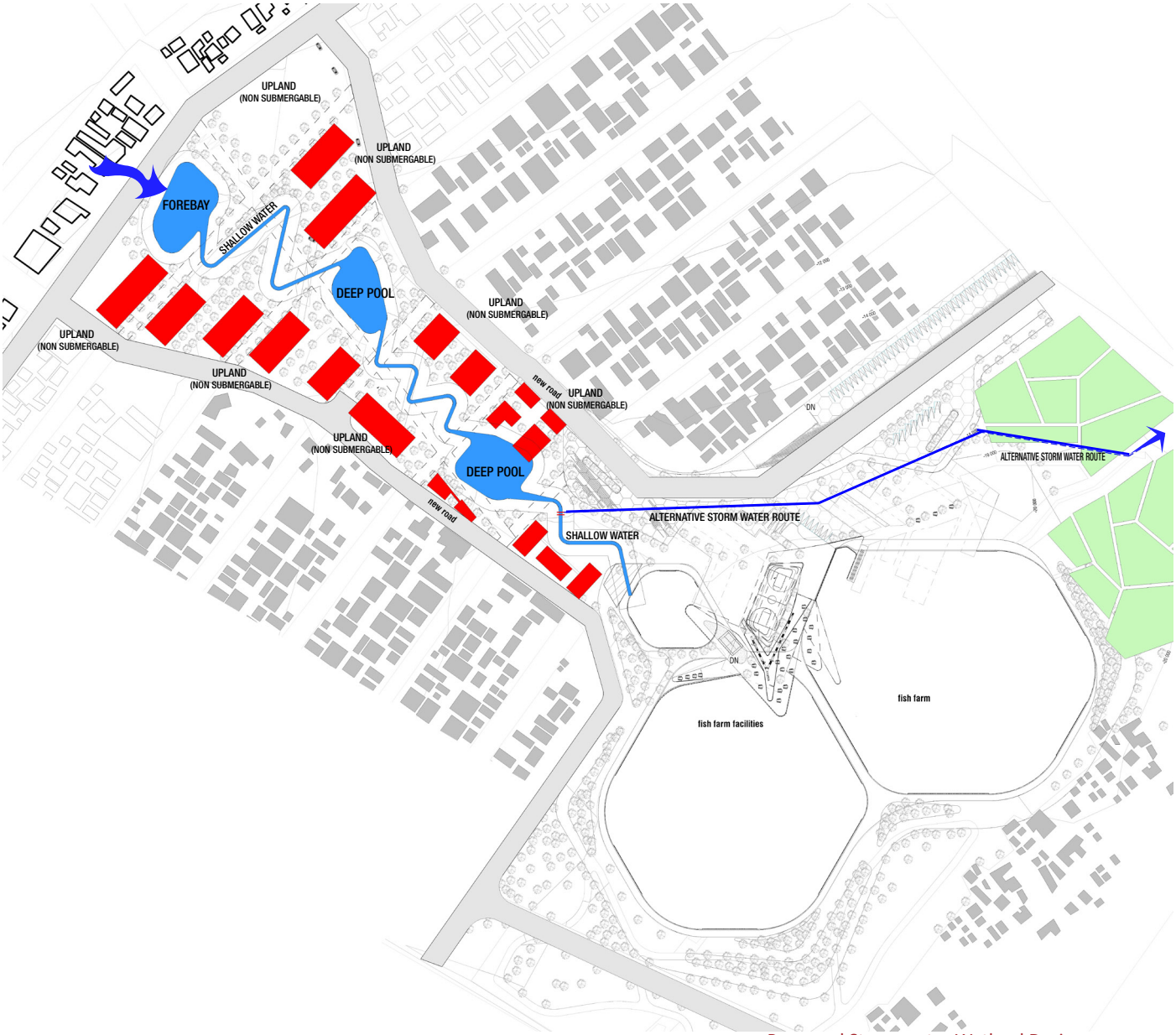
Fish are incredibly temperature sensitive as highlighted in the earlier case Studies, it is essential to provide optimum temperature controls to ensure a commercially viable fish farming business throughout the year. Magen Solar Collector offers a sustainable solar heating solution. With a temperature monitoring system in place, cooler water from the fish ponds can be circulated in the solar collector and fed back into the fish ponds. A backup heat pump helps increase the water temperature during the cooler months of the year.

The building

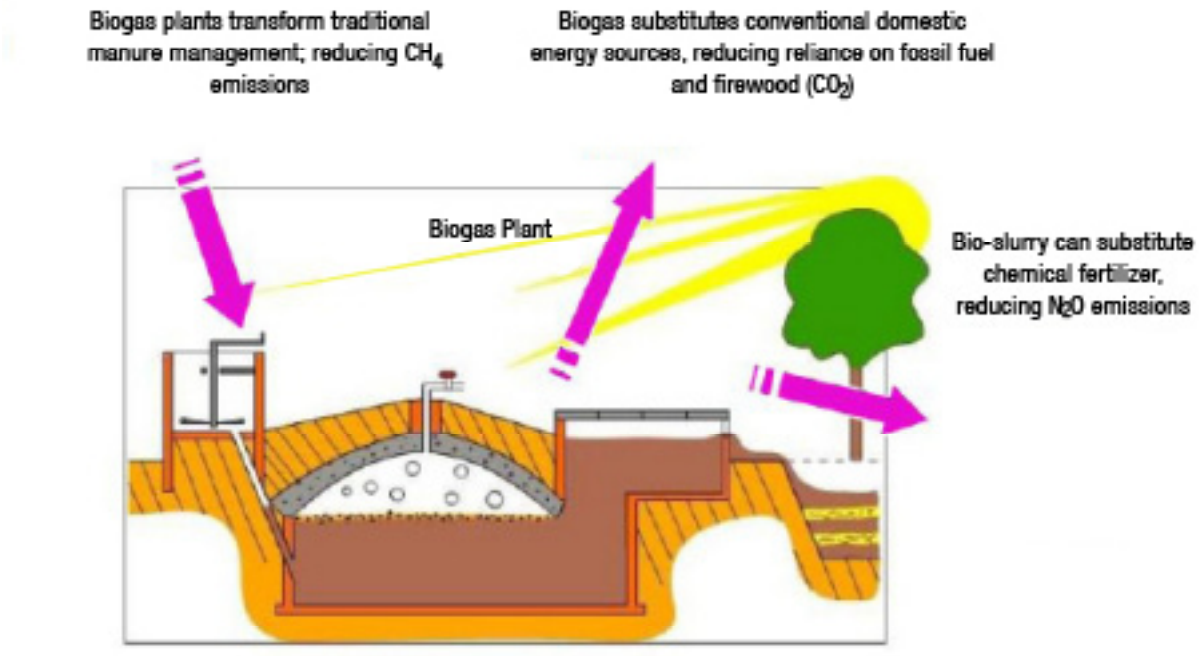
Solar systems can also be employed to keep temperatures at their regulated average within the built fabric where the fish are processed, stored or sold.

Similarly, cold water is circulated into the solar panels, heated and distributed accordingly. This system can also be used to heat up the anaerobic digester system (discussed in the next section) that is employed by the project.

The following image illustrates the application of wetland design in the chosen Diepsloot site



Proposed Storm water Wetland Design
Source: Author



The benefits of agricultural small-scale biogas plants. Source: http://www.sswm.info/category/implementation-tools/wastewater-treatment/hardware/site-storage-and-treatments/anaerobic-di, 2014

3. Energy

The project is primarily aimed at establishing independence for the heavily strained municipal services in Diepsloot, even at phase one level. Potential sources of Energy that both relieve the power grid of the burden of yet another development and also the service grid are investigated in this section.

3.1 Organic waste as raw material

The main forms organic waste to be considered are:

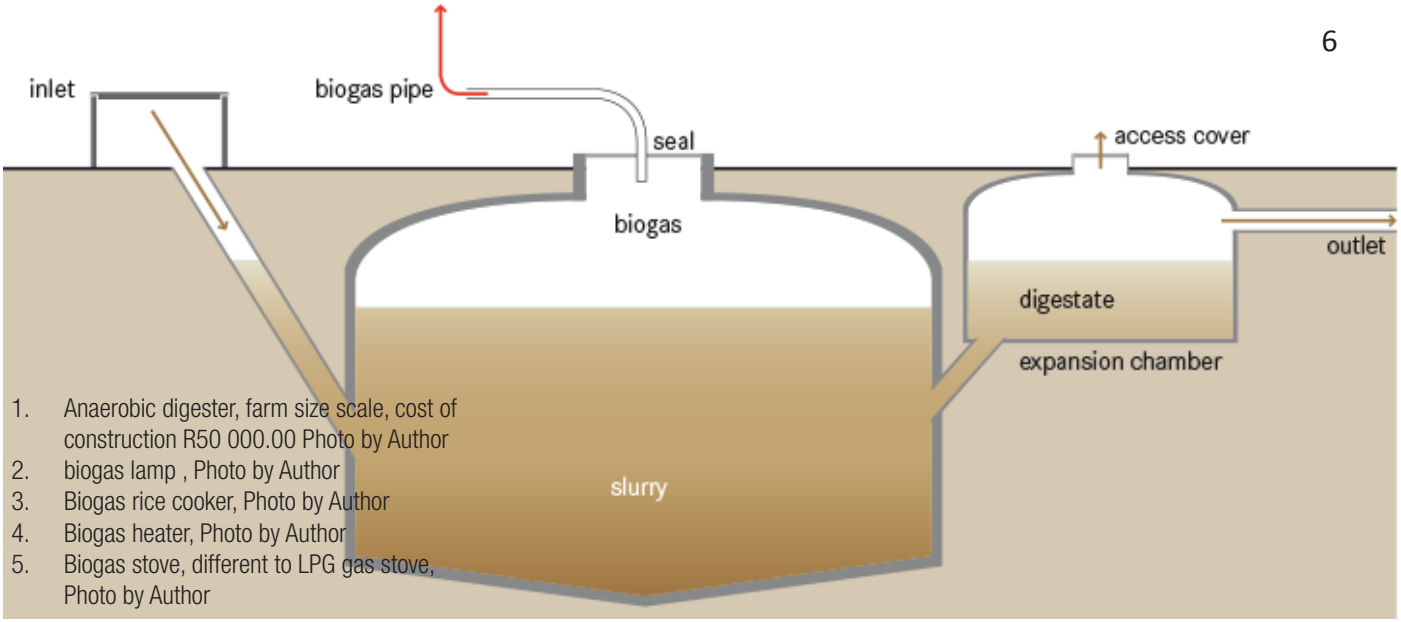
- Black and grey water from the facility and surrounding dwellings
- Organic waste from the market and cooking market,
- Surplus fresh produce from the organic farming project
- Plant waste/cut grass from the recreational landscaped areas

The traditional means of independent waste disposal for these forms of waste would have perhaps been a septic tank for the black water and composting for the organic material waste forms. A more efficient, contained means of decomposing waste, yet preserving nutrients while producing the by-product of biogas is implemented in this project. An Anaerobic Digester (AD) would be best suited for this purpose. Some of the advantages of an AD according to the Sustainable sanitation and waste water management, 2014(Online, sswm) are listed below:

- Generation of renewable energy
- Small land area required (most of the structure can be built underground)
- Can be built and repaired with locally available materials
- No electrical energy required
- Combined treatment of animal, human and solid organic waste
- Conservation of nutrients
- Long service life
- Low to moderate capital costs; low operating costs (Online , sswm)

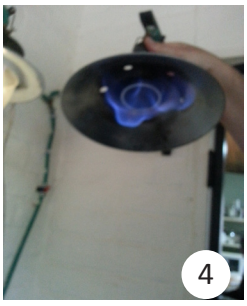
AD illiustrated in images 1,6 & 7, are described as a covered system of tanks and a generator unit, in a publication by the Climate Change local area support programme(CLASP),2014,

An AD produces a mixture of flammable gases known as biogas, with the main component being methane gas, which can be used to fuel a gas generator to produce electricity. The biogas produced has the potential of being purified to remove the non-flammable gases and sold to the gas grid according to CLASP, 2014. This possibility could perhaps be explored in the second phase of the project, as it could further build Diepsloot`s economy and also relieve the Northern Waste Water Treatment Facility of its burden of waste water treatment. The Residual solid water is rich in nitrogen and can be used as manure. This could potentially be



1. Anaerobic digester, farm size scale, cost of construction R50 000.00 Photo by Author
2. biogas lamp , Photo by Author
3. Biogas rice cooker, Photo by Author
4. Biogas heater, Photo by Author
5. Biogas stove, different to LPG gas stove, Photo by Author

Schematic of a biogas reactor. Source: http://www.sswm.info/category/implementation-tools/wastewater-treatment/hardware/site-storage-and-treatments/anaerobic-di, (2014)



sale, or used locally on the organic produce farm.
Below is some data obtained from Mark Tiepelt , founder of BioGas South Africa:

Suitable digesting temperature	37deg.
Retention time	40 – 100days
Biogas energy	6kWh/m3
Biogas generation 0.3 – 0.5 m3 gas/m3 digester volume per day	
Human yields	0.02m3 / person per day
Organic waste	0.4m3 / kg
Gas requirements for cooking	0.3 to 0.9m3 / person
Gas requirements for one lamp	0.1 to 0.15m3 / h

Assuming that on average, based on the square meterage of the Cooking market and the Organic Produce Market, 500 people would contribute to the black water collection (with the assumption that the shortage of formal sanitation facilities, residents would also flock to the centre) per day.

An estimated yield of 33m3 of biogas would be produced, which translates to 200kWh of energy per day. Assume also that a minimum of 100kg of organic waste was generated by the farm and the market; estimated yield would be 40m3. In total 73m3 of biogas would be produced which translates to 438kwh.
This Amount of energy would only be able to power the facility and cook for at least 20 people, which is simply insufficient to take the development off the grid. In order to remove the development off the grid, power required includes:

- Gas for at least 200 people eating 100m3
- Lamps assuming 500 lamps, 75m3
- Cold rooms 168kwh per day 28m3 of biogas

183m3 of biogas is required a day in order to take the development off the grid, this translates to the total contribution of 3 660 people per day. The table below indicates the current status quo for blackwater removal in Diepsloot. 7.5% of the residents of Diepsloot still use the bucket system. This translates to about 11 250 individuals per day requiring a space to dispose of their blackwater, ie three times as much required to take the project off the grid. An incentivised programme where perhaps residents can supply the anaerobic digesters with their blackwater in exchange for the surplus biogas the development produces, would make the project highly feasible and would undoubtedly address the current problem of blackwater disposal. In the long term, this system could be replaced with a piped system if enough power is generated for sale and the revenue generated invested into improving blackwater delivery to the digester. This next phase of development could see the complete blackwater diversion from the Municipal grid, thus relieving the strain and providing alternative means of energy to the area.

Variable	Diepsloot (%)	
	✓ Unspecified / other	1.0
Toilet facilities	✓ Flush or chemical toilet	85.8
	✓ Bucket latrine	7.5
	✓ Pit latrine	3.3
	✓ None of the above	2.9
	✓ Unspecified/Dummy	0.5
Access to water	✓ Piped water inside dwelling	65.0
	✓ Piped water inside yard	20.7
	✓ Other/Unspecified/Dummy	5.7
	✓ Piped water on community stand: distance greater than 200m. from dwell	5.1
	✓ Piped water on community stand: distance less than 200m. from dwelling	2.6
	✓ Water-carrier/tanker/Water vendor	0.4
	✓ Borehole/rain-water tank/well	0.4
	✓ Dam/river/stream/spring	0.1

Source: Demacon, 2012

3.2 Solar power as raw material

Mark Tiepelt, 2014(founder of BioGas South Africa) in an interview, gave insight on the optimum conditions that an Anaerobic Digester works, based on his vast experience with the systems. He explained that the microbes that are involved in the anaerobic reaction work best at body temperature, ie 37 degrees. In order to raise the temperature of the Digesters to their optimum, they would need to be heated by a heat exchange process.

Alternatives included harvesting the heat produced by the gas generators and channelling it toward the Digester tanks, alternatively the use of solar heated water as a means of heat exchange. He mentions how, in order to go off the grid, one has to list their energy requirements and account for each and every one of them, thus leaving contingency for a rainy day. Integrated Sustainable system (online, sustainable systems, 2014) also employs a similar technique. Their rule of thumb relevant to this thesis is listed below:

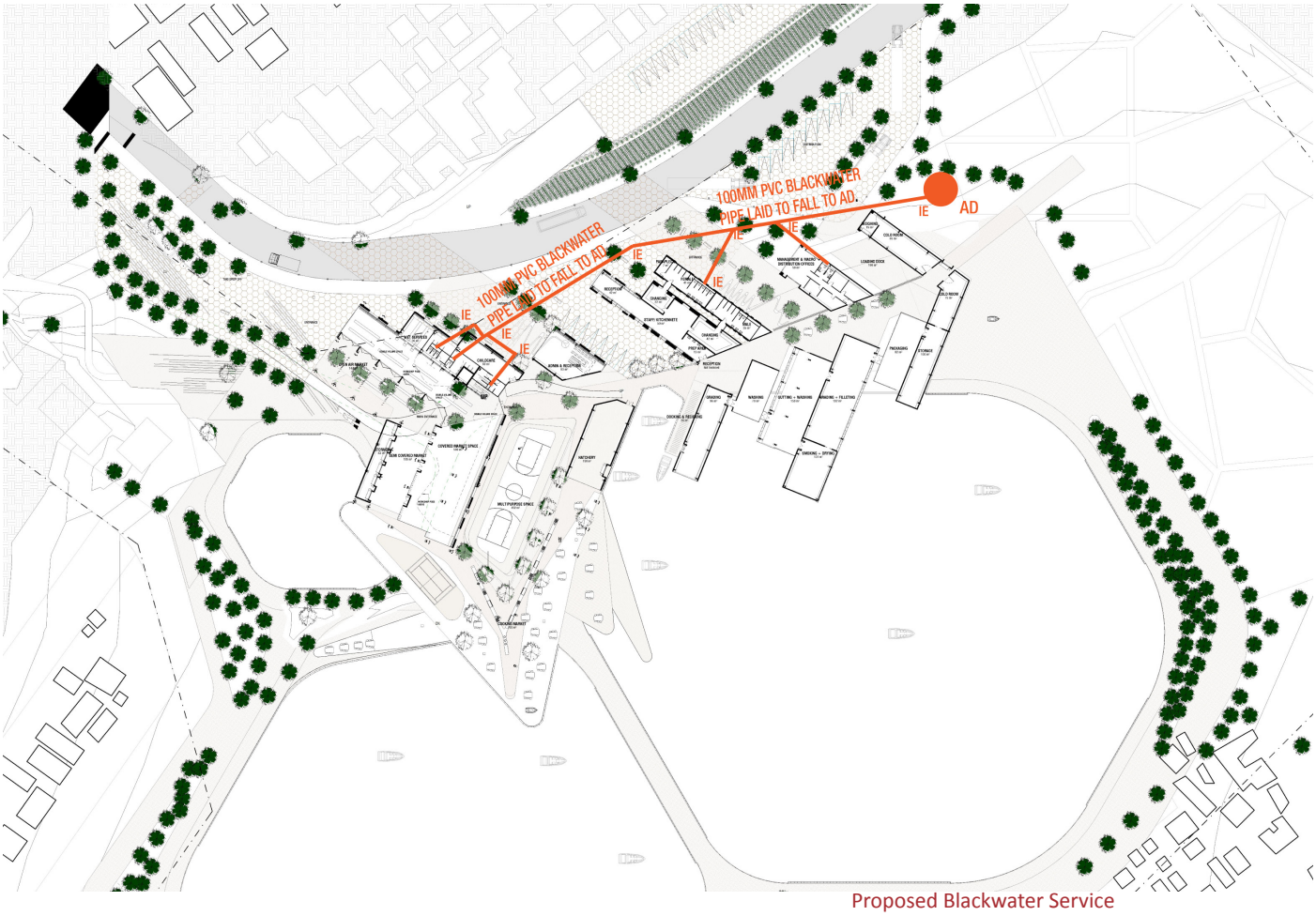
- Water Heating – go Solar or Heat Pump
- Cooking – convert to Gas (natural/bio if available, or LP if not)
- Heating – Use Gas (natural/bio if available, or LP if not)
- Cooling – Avoid/reduce air-con, use natural ventilation or fans if possible, paint your roof a lighter colour, using refractory ceramic paint. This hybrid approach will be used in this thesis, where the biogas is primarily used to generate power for utilities that cannot be operated with gas, such as cold and freezer rooms in the fish processing facilities, outdoor lighting, and other general admin related power uses such as computers.

Biogas heaters and cookers can be used for outdoor purposes, with their light fittings used in more controlled indoor environments.

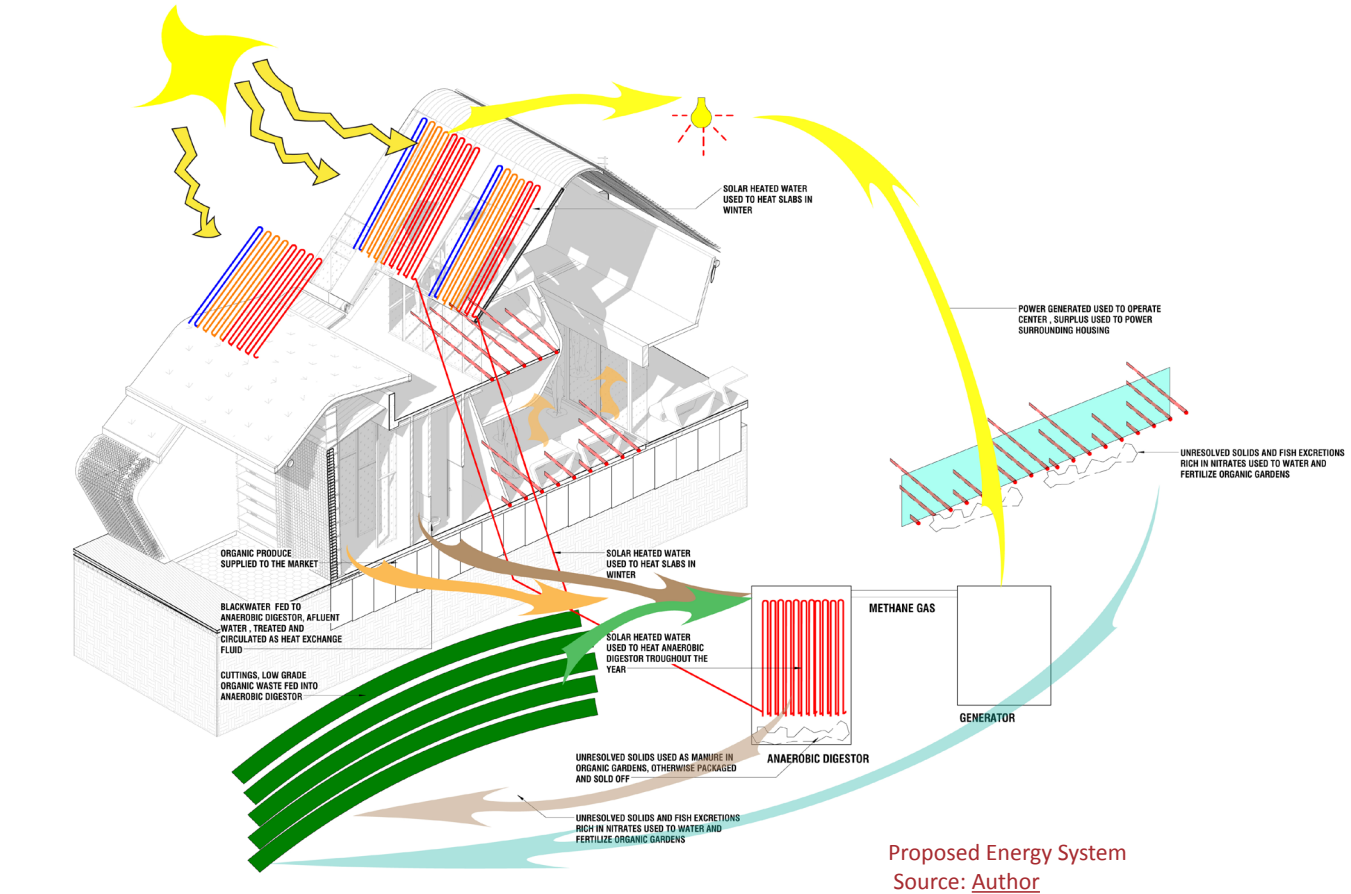
Solar will mainly be used for water heating, which in turn, can be used for heating spaces in winter. This can, however, be complimented by the heat produced by the gas generators on cloudy days.
Water heating in this thesis is not only limited to its application in the building, but also extends to the fish ponds

3.3 Solar power as raw material: The Fish Ponds

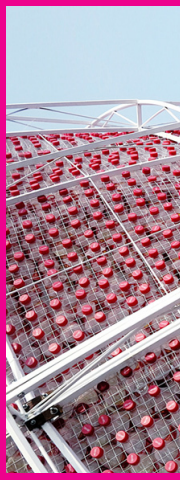
Fish are incredibly temperature sensitive as highlighted in the earlier case Studies and it is essential to provide optimum temperature controls to ensure a commercially viable fish farming business throughout the year. Magen Solar Collector offers a sustainable solar heating solution.
With a temperature monitoring system in place, cooler water from the fish ponds can be circulated in the solar collector and fed back into the fish ponds. A backup heat pump helps increase the water temperature during the cooler months of the year.



Proposed Blackwater Service
Source: Author



Proposed Energy System
Source: Author



4.1 The Building, Use of recycled Bottles, Variations in construction detailing, material and finishes

Bottles as a building material illustrated in images the above images, is a sustainable substitute for bricks developed by a German engineer Andreas Froese, founder of 'Eco-Tec', in Honduras, South America in 2001. A mud filled plastic Polyethylene Terephthalate (PET) bottles is said to be stronger and more durable than brick according to a study conducted by the department of Civil and Environmental engineering at the University College Cork in Ireland(UCCI), 2014). Using plastic bottles instead of brick has the following advantages:

- It provides solutions to bulk waste from Soft drink bottles, mineral water bottles, wines bottles amongst others.
- It is low cost
- Plastic bottles are non-brittle unlike bricks, and hence are able to absorb abrupt shock loads
- The have the same compressive strength as concrete according to lab experiments conducted by UCCI, 2014
- It is labour intensive to make the bottle brick, on average it is estimated to take 30 to 60 minutes to fill and compact according to UCCI,2014, thereby creating employment opportunity for locals.
- They bear decorative properties
- The have a relatively high sound reduction index compared to concrete according to UCCI,2014
- The bottle brick is light weight hence reduced transportation costs as well as reduced injury chances
- They save on trash travel allowance and landfill space (UCCI,2014)
- They can be filled with either sand, or waste plastic (weight should not be less the 240g)

Various finishes can be achieved depending on design intention. Applications can even be location specific and space identifying even for the disabled. Plastic bottles can also be used for sculptural purposes, as illustrated in the images done by Penda in Beijing, China as a statement against plastic pollution and for taking trash and turning it into shelter (Online , http://www.archdaily.com/394382/the-cola-bow-installation-penda/)

1. Bottle brick with plastic infil(online source, www.researchgate.net/...bottle...bricks/.../02e7e5357f926d157f000000?...))
2. Bottle brick with sand infill (Online, http://humansarefree.com/2013/12/genius-how-to-end-homelessness-in-one.html)
3. how to make a coulmn (Online, http://humansarefree.com/2013/12/genius-how-to-end-homelessness-in-one.html)
4. how to layout bottle brick
5. building on a curve (Online, http://nigerianarchitecture.blogspot.com/2011/09/bottle-house.html)
6. finishes, textured (Online, http://www.instructables.com/id/New-Innovation-in-Construction-using-Waste-Plastic/)
7. other techniques
8. finishes contrast, smooth and textured (Online, http://www.instructables.com/id/New-Innovation-in-Construction-using-Waste-Plastic/)
9. other techniques for sculptural installation(Online, http://ad009cdnb.archdaily.net/

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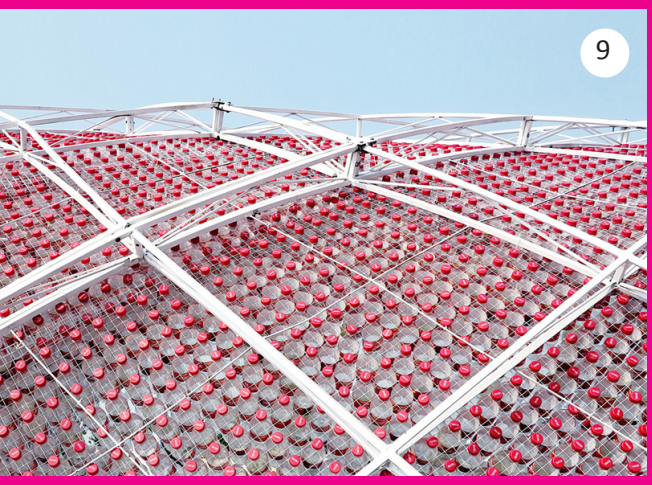

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wp-content/uploads/2013/06/51ca7881b3fc4b571e0000a4_-the-cola-bow-installation-penda_bottles_ph_05.jpg)

10. structural framing, (Online, http://ad009cdnb.archdaily.net/wp-content/uploads/2013/06/51ca7881b3fc4b571e0000a4_-the-cola-bow-installation-penda_bottles_ph_05.jpg)
11. Day view of installation
12. night view(Online, http://ad009cdnb.archdaily.net/wp-content/uploads/2013/06/51ca7881b3fc4b571e0000a4_-the-cola-bow-installation-penda_bottles_ph_05.jpg)

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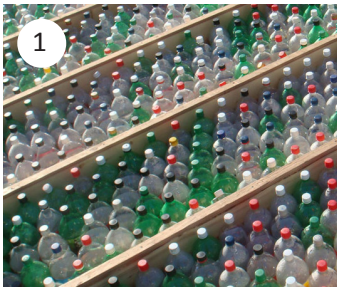
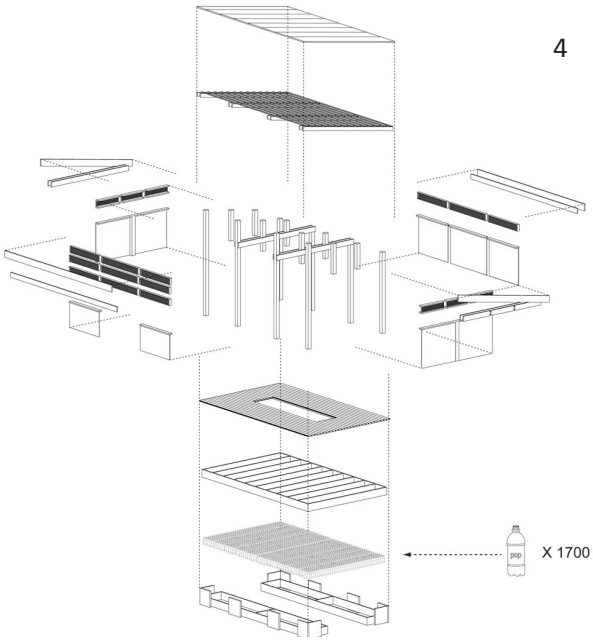
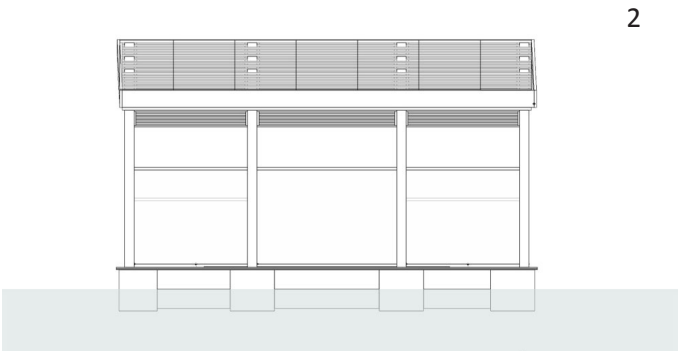






The Building, Use of recycled Bottles, Flotation

Recycled bottles can be used as sustainable flotation devices. The Floating Dining Room designed by Goodweather Design & Loki Ocean architects in Vancouver, BC, Canada, 2010(Online; archdaily.floating-dinning-room) gives an example of the application of this method.

1700 recycled plastic bottles were secured between cider timber rafters supporting a timber deck, posts and beams and a roof.

The structure was designed to carry 12 dinning people, illustrauted in images 1 to 4. The structure is free to move but is secured to the sides with a rope to prevent it from floating away.

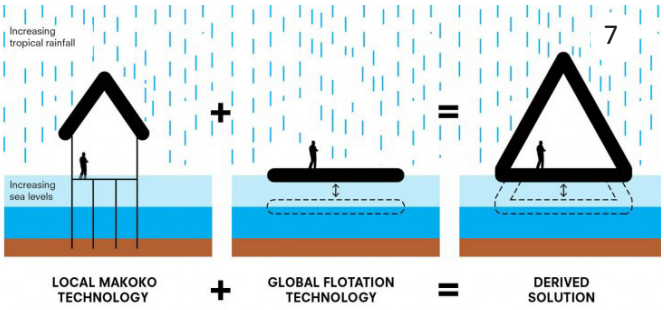
Alternative means of floatation would involve the use of recycled drums. Makokos floating school in Lagos ,Nigeria designed by Architect Kunlé Adeyemi in 2012 is an example of a more long'-term application of recycled drums. Makoko is a 'slum community 'with a population of 100 000, located on Lagos`s lagoon, illustraed in image 5 and 6. The houses in this community are built on stilts; there are no conventional or formal roads, land or infrastructure to support it.

Makoko is said to epitomize the challenges posed by urbanisation and climate change across Africa while inspiring new solutions and alternative s to the culture of land reclamation.

(Online,architectural-review.makoko-floating-school-by-nle-architects-lagos 2013)

The stilt technology has its limitations because of its rigidity and inability to adjust to change in tides, however, this problem is resolved by the use of the recycled plastic barrels ,illustrated in images 7-10.

The shape of the structure offers the added advantage of a low centre of gravity which provides stability even in turbulent conditions.



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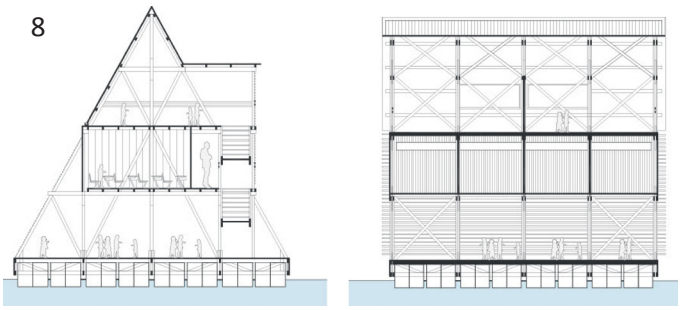

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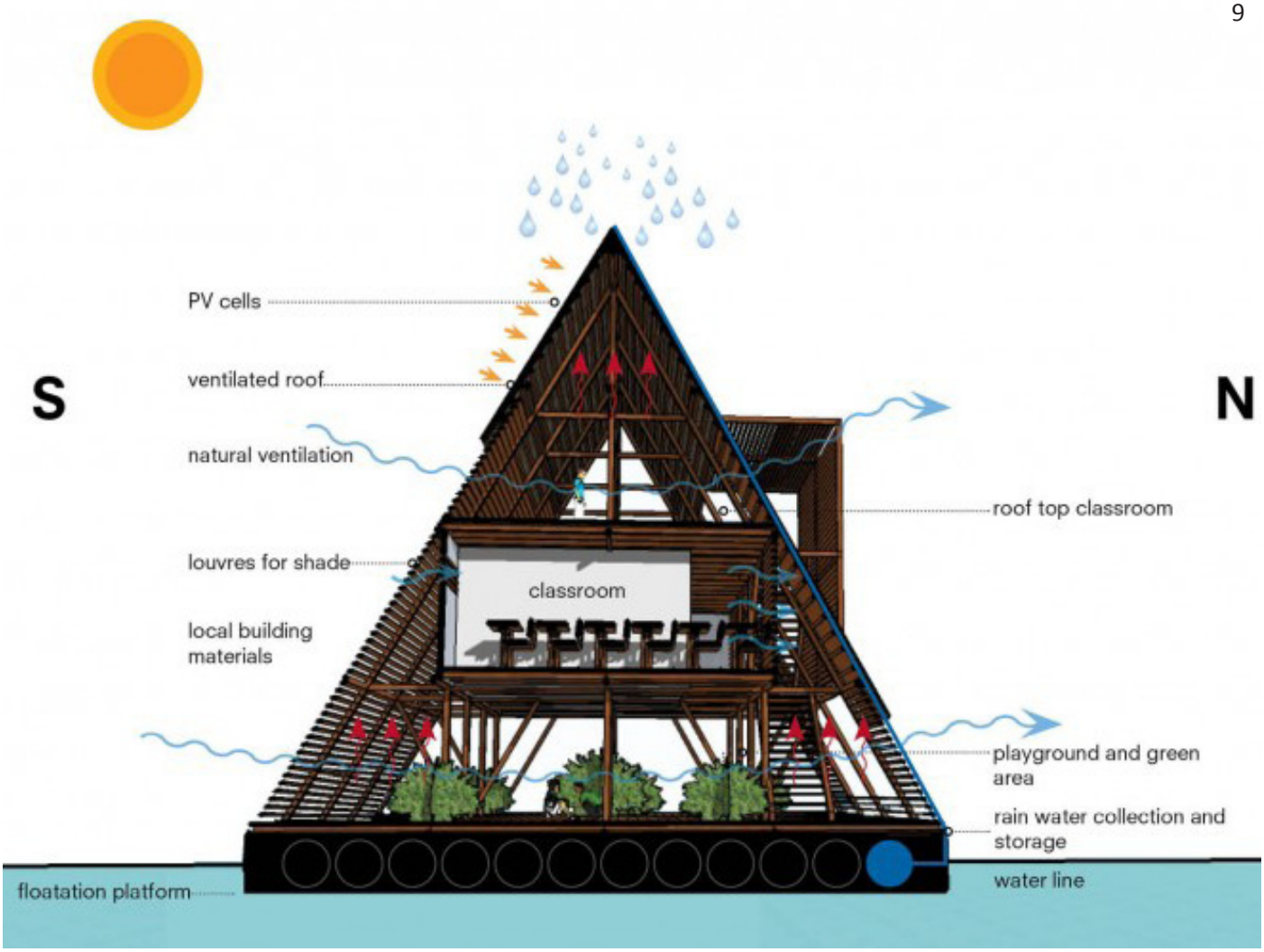

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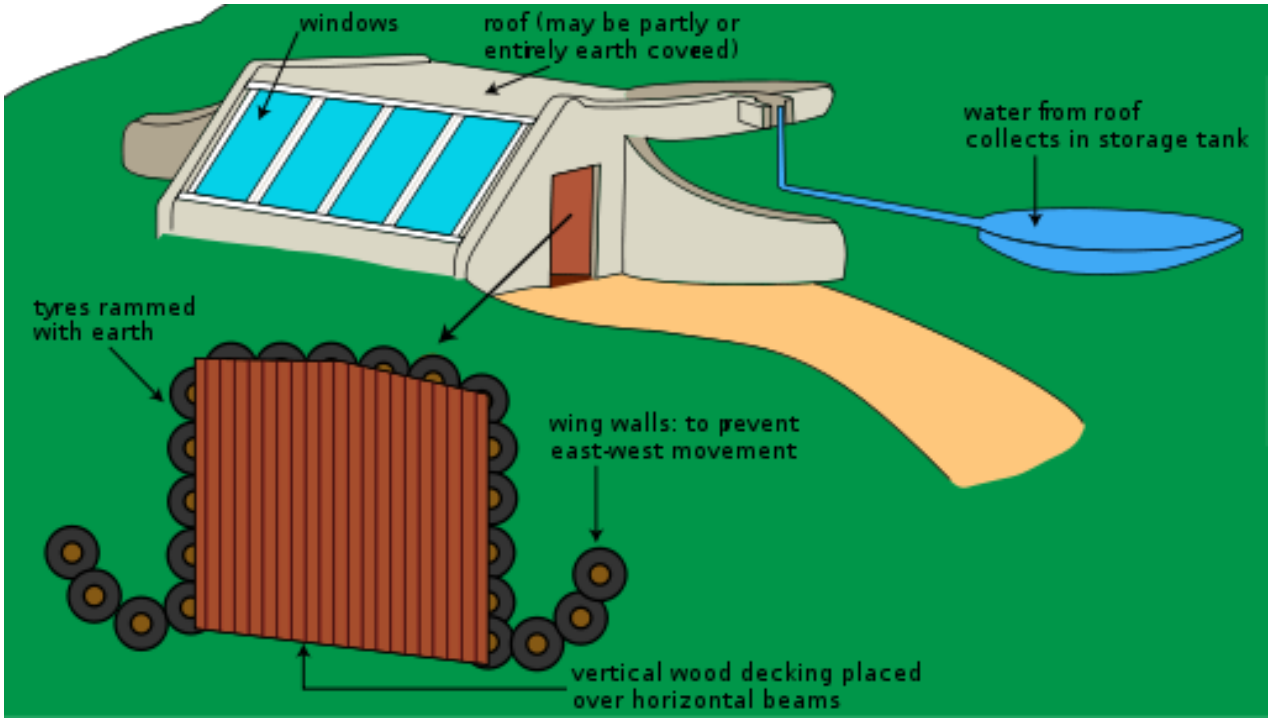
1. Bottles secured between rafters,
2. Section through floating structure
3. Floating deck, secured to platform
4. Axonomitric of assemly(source online, Floating dining, http://www.archdaily.com/71382/floating-dinning-room-goodweather-design-loki-ocean/
5. Map of Makoko
6. Aerial view of the floating community
7. Diagram showing the floating technology development
8. Sections through the school
9. Sustainability systems
10. Aerial view of School

images 5-10 ,Source online,

•Makoko, http://www.architectural-review.com/essays/makoko-floating-school-by-nle-architects-lagos/8655821.article



Trye detailing, Source: http://www.ejge.com/2008/Ppr0825/Ppr0825.pdf

The Use of recycled material – Tyres

It is estimated that there are 60 to 100-million abandoned tyres across South Africa, according to an article published in Business Day, 2014 publication.

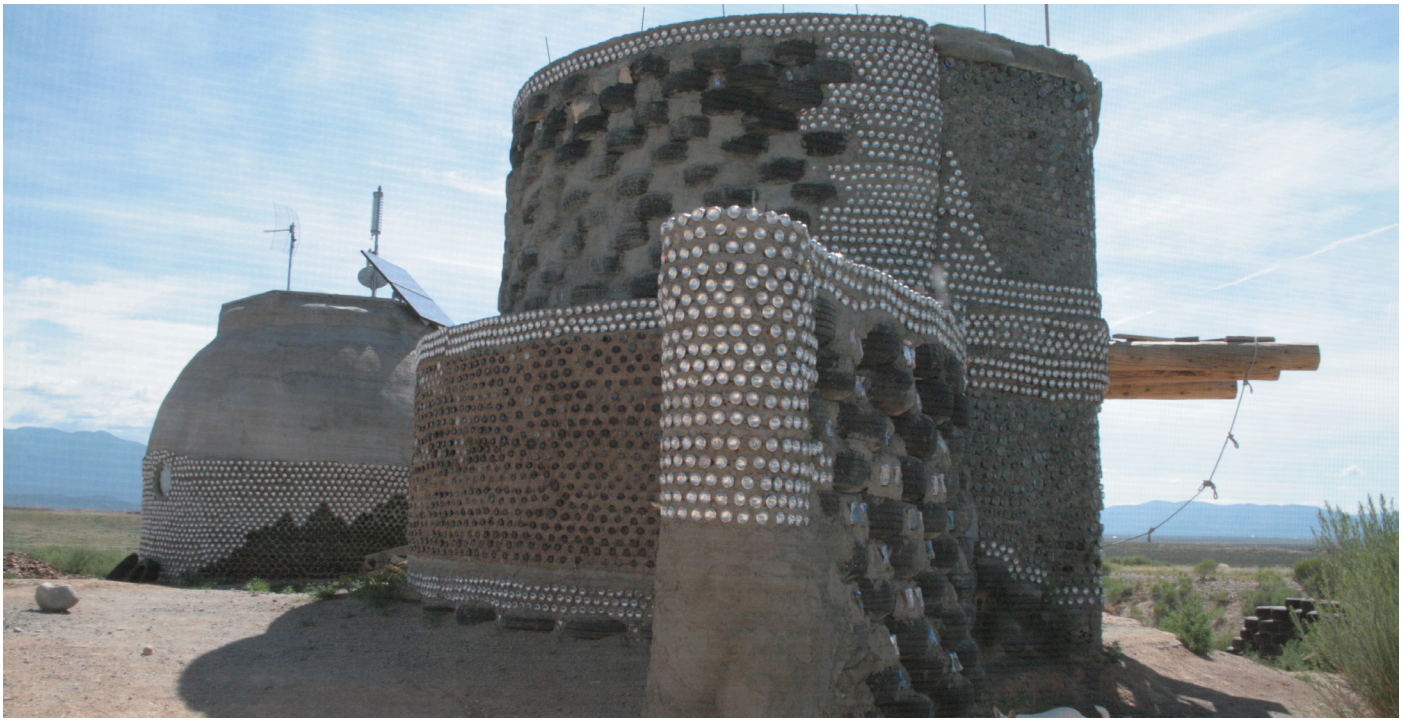
These tyres present unlimited opportunities for other applications outside their primary intended use. Tyres are composed of rubber or polymer materials, reinforced with synthetic fibres and high strength steel which give tyres high tensile strength, flexibility and when combined with another material, high in compressive strength, they can be used as building blocks in construction (Bund,2008).

Tyres in Civil Engineering applications can be used as subgrade fill and embankments, backfill for wall and bridge abutments, septic system drain fields, beach erosion control, and sound attenuation systems (RMA, 2007).

According to an online publication by the University of Malaysia, 2008, the use of recycled whole tyres is preferable to shredded ones, as there is no additional energy used in further processing.

The publication recommends that in applications where tyres are used as embankments, the individual units should be tied together, ideally with polypropylene rope, as it is high in strength and flexibility, as well as corrosion and chemical resistant, filled and compacted in backfill as illustrated in the images.

This system is considered to be a sustainable means of construction, as the materials used are all recycled, and no heavy machinery or skilled workers are required for construction, making it highly suited for implementation in an area such as Diepsloot. Images above illustrate various applications of recycled tyres.



Trye houes, Source: http://www.ejge.com/2008/Ppr0825/Ppr0825.pdf

sustainable finish aplications,Source: http://inhabitat.com/beintween-recycles-old-car-tires-into-matireal-for-permeable-park-pathway/

a) Laying first tires in mat configuration, with each tire tired together with polypropylenes rope Source, http://www.bdlive.co.za/business/industrials/2014/08/18/tyre-recycling-sets-off-on-road-to-environmental-sustainability

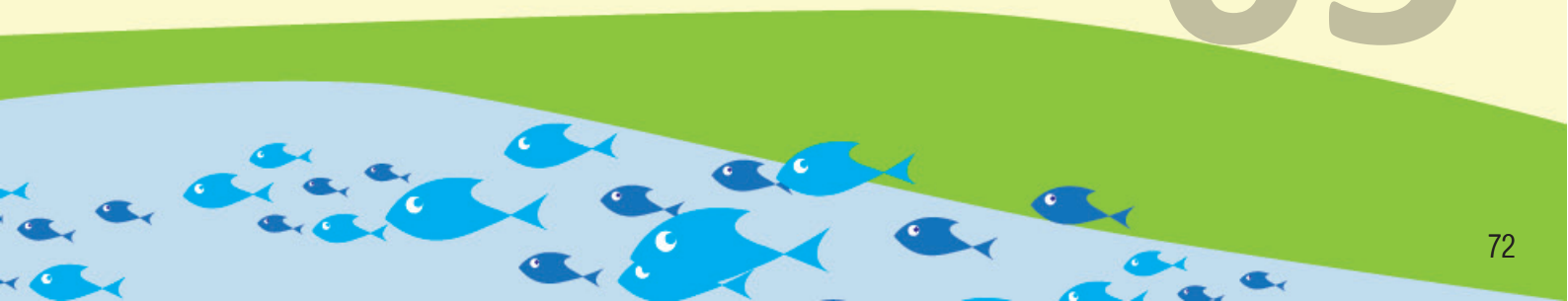
b) Backfilling tire mat layer with in situ cohesive material and compaction, Source: http://www.bdlive.co.za/business/industrials/2014/08/18/tyre-recycling-sets-off-on-road-to-environmental-sustainability

c) The Complete Structure, Source: http://www.bdlive.co.za/business/industrials/2014/08/18/tyre-recycling-sets-off-on-road-to-environmental-sustainability

In this chapter, a design program will be established. As a fish farm is quite facility-specific, the aid of a fish farm case study will be used to assist in the determining of the specific functional areas. Case studies will be used to explore and try to establish the appropriate design language the project should take on and, finally, a concept and design proposal will be put forward.

1. Design Development
2. Case Studies
3. Concept
4. Fish Farm and Processing Facility

CHAPTER 05



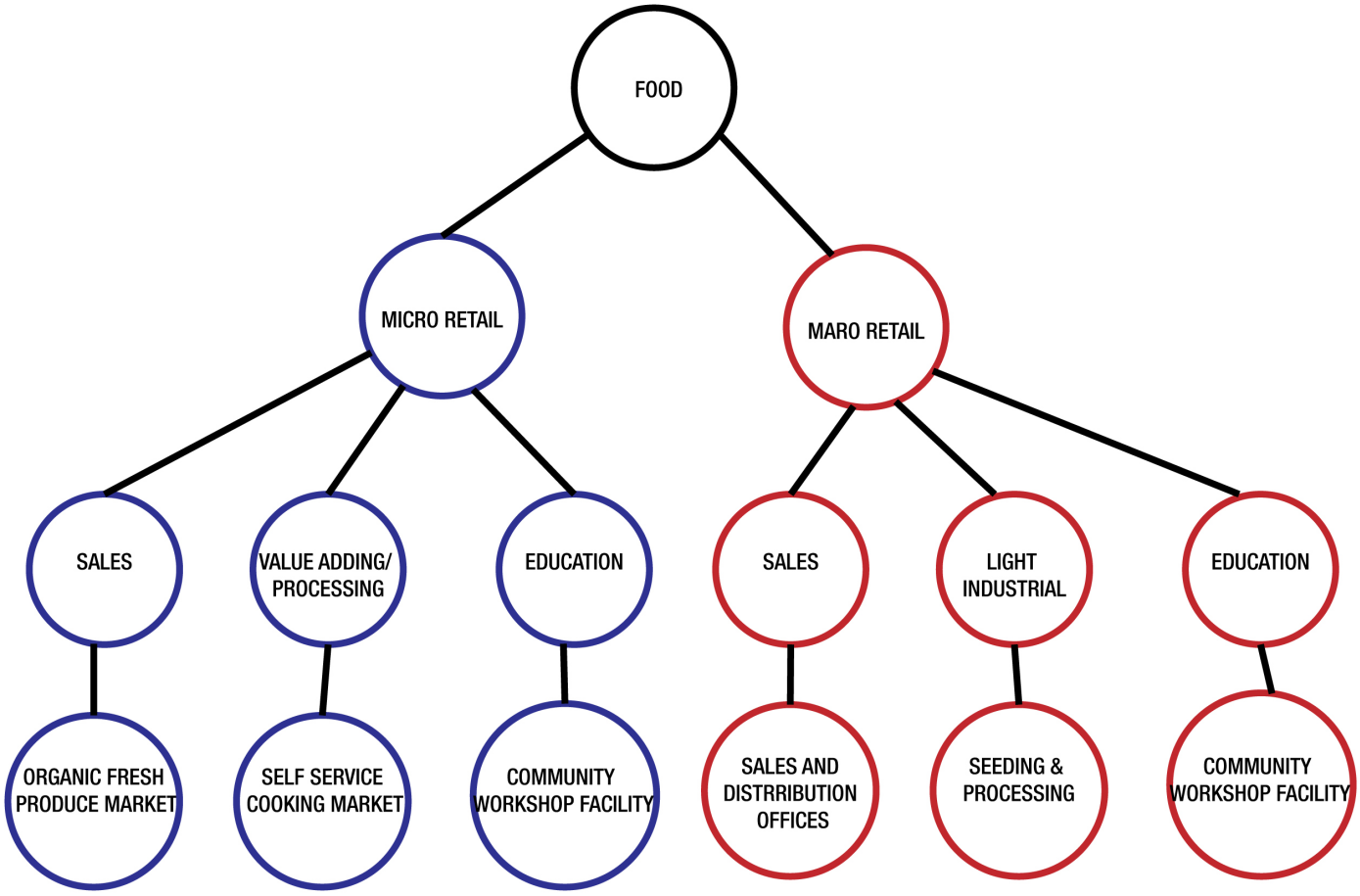


Chart 1: Proposed Programme
Source: Author

Focus

The design system should act as a precedent of how macro business needs and micro business needs can exist together whilst contributing to each other's growth and addressing the needs of a community. The design system could be described as a an pen platform of improved social relationships, cultural culinary exchange and improved diets, micro business growth, skills development, improved living conditions as well as urban or rural development.

The system is aimed at freeing itself from the over loaded municipal grid and contributing to the independence from the electrical grid of Diepsloot as a whole. It should display its core idea of recycling in order to encourage creating ways of reusing materials.

The development spine should address the immediate urgent need of wetland reclamation and treatment, and be able to accommodate future development into a vibrant development node. It should also respond to the urgent need of improved dietary, health and wellbeing of the community while encouraging self-empowerment.

The overall development should be realised in phases and its culmination should encourage economic growth without taking away from the existing systems.

The first phase is to oversee the wetland design and upgrade into a fish farm and fresh produce market using as much recycled material as possible, training and use of local labour. In addressing the food aspect, the immediate health and wellbeing of the community is addressed paving way to addressing other issues within the community. The infrastructures will assist in dealing immediately with water handling, flood control and waste water management for surrounding dwellings.

The Programme

The food aspect of retail centre development forms the main focus of the first phase development. The hybrid typology proposed will consist, as earlier mentioned, of retail, light industrial and educational components. These components will facilitate and accommodate entrepreneurs that form part of the demographic of the community of Diepsloot, at a Micro and Macro retail level, as illustrated in Chart 1.

Micro Retail: Sales

Within the Organic Fresh Produce Market, the three different scales of Micro retailers established in chapter one and illustrated in Chart 2, will operate and conduct the sale of produce.

The different spatial specifications are aimed at creating a framework that can accommodate the different types of entrepreneurs, beginning with the survivalist type, who are unable to afford rentable space, being incorporated into the scheme with the aim of encouraging the growth of their business into the more sustainable opportunistic type of retailers.

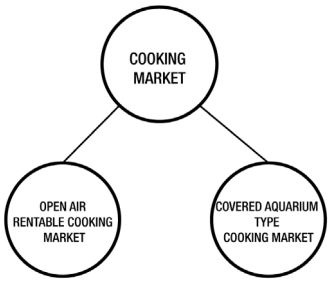


Chart 2: Proposed Scales of Dining
Source: Author

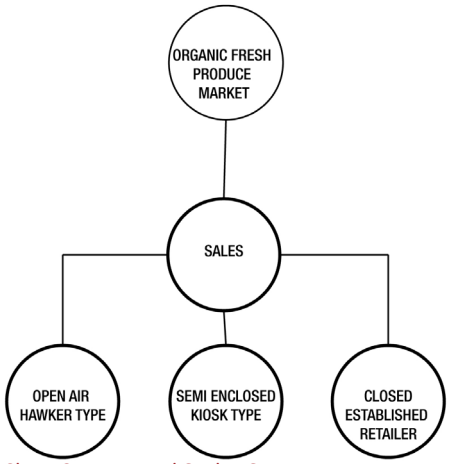


Chart 3: Proposed Scales Space
Source: Author

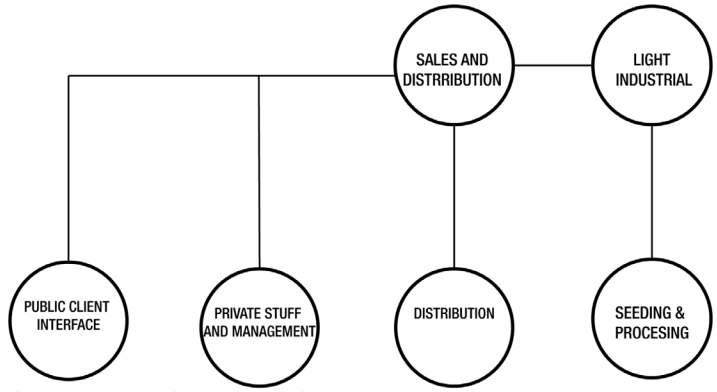


Chart 4: Proposed Macro Retail Programme
Source: Author

Value adding/ Processing

The value adding and processing is aimed at accommodating the preparation of food for consumption, produce directly purchased from the Micro retailers is cooked on site by the two types of sales, the affordable hawker-type of open air cooking and the a more exclusive fine dining aquarium type of cooking market, that enjoys visual access to the fish growing ponds, also forms part of the scheme.

Education

These aforementioned spatial typologies are all linked to an educational workshop facility aimed at mitigating the lack of business structure common in Micro retailers. These spaces are to be flexible enough to host any other workshop type educational programmes that are relevant to the community such as diet, health and others.

Common shared amenities including bathrooms, changing rooms, produce wash up areas and storage facilities, which will be provided to support the functioning of the facility. Shared open spaces will be aimed at encouraging social interaction, cultural exchange and offer a place of refuge for the workers and residents from the dense, poorly serviced informal settlement environment.

Macro Retail: Sales

As illustrated in Chart 4, Macro retail will be run by a more established medium business enterprise, which will require facilities for public interfacing with the client, distribution and its own administrative purposes. This enterprise will run the hybrid programmes that will incorporate the light industrial fish processing facility, as well as the actual fish farm.

Macro retail: Education

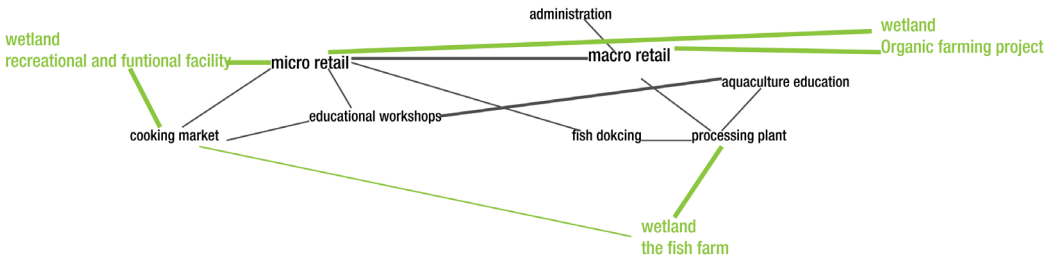
This aqua-culture prototype is envisioned as a precursor to several other fish farming projects that could be rolled out on smaller holding plots over these wetland and, possibly, in other such townships that are located close to a natural resource of this kind. Educational work shopping facilities will be provided for the purposes of training staff, community members and visitors who would be keen to learn more about fish farming.

Programme development

In order to develop an adequate understanding of a commercially viable aqua-culture development, Lunsklip Fisheries in Lyndenburg, Mpumalanga is explored as a case study in the following section.

An interview with the owner Mr Gary van der Merwe brought to light the various considerations that are fundamental to a successful aqua-culture project, these include:

Fish Farming Processes
Source: Author



Spatial Relations
Source: Author

- The type of fish
- The type of feed required and how readily available the feed would be
- The climatic conditions of the area the fish to be cultured
- The market demand for the type of fish
- Sources of water

Mr van der Merwe (2014) recommended Ciprinus Carpio(Carp) for the informal settlement development, as this fish type is an omnivorous fish, meaning it can feed on almost anything, ranging from plants, algae, fungi and select bacteria, which would significantly reduce the cost of feed.

Carp is also a hardy fish, according to Mr van der Merwe (2014), as it thrives throughout the year, under varied temperature conditions, although its optimal growth temperatures are around 30 degrees.

They can be easily supplemented by solar heating during winter. Mr van der Merwe (2014) thoroughly supported the development of an aqua-culture project in an informal settlement, as he believed it would greatly contribute to job creation, revenue production and the upliftment of the community.

A tour of the farm brought to light the requirements for the production process and discussed in the next Section.

The Production Process

Fish eggs are fertilised, incubated and allowed to shell in the hatchery, thereafter transported to the nursery, where they are left to grow. The fish are moved to two other ponds in the process of growth.

They are then harvested from 14 to 18 months, caught in throw nets, with holes that allow the smaller fish to escape and only mature fish to be caught. These fish are then transported to the processing plant, to be washed, gutted and washed again, smoked, deboned and split in half, processed into the different cuts, packaged and put into holding freezers, as illustrated in Figure 2 .

As fish are quite sensitive to bacteria, the processing plant is kept cool and very well ventilated at all times. Water resistant white coloured finishes are applied to the floors and walls and water is constantly used within the processing procedures. The processing plant also has specific staff requirements, these include a separate staff access point that links to a changing room , shower and ablution facilities and directly to a hand sanitation area, shoes sanitisation zone and then to the plant, as illustrated in Figure 3.

Fish Processing
Source: Author

Synthesis

These specific spatial requirements translate into a programme that clearly requires the separation of the fish processing plant, as it requires more control and separation from the public, a Macro retail facility that is accessible to the public, yet directly linked to the processing and administrative functions of the plant, a public Micro retail space and the relevant educational facilities linked to the specific areas as illustrated in Figure 4.

The main link established is between the Micro retail, Macro retail and the relevant wetland functions, as illustrated in Figure 4.

Secondary links are between the educational facilities and tertiary links are indicated by the thinner link lines in Figure 4.

All functions hinge on both vehicular and pedestrian movement systems, with the Micro retail directly linked to the proposed public transport node and the Macro retail linked to the truck docking zone. The pedestrian movement route reinforces the main movement route, primarily connecting the relevant nodes as required.

Having established the spatial requirements of the developments, an appropriate design language will be explored by the use of case studies in the next Section.

Image 1: 'Biblioteca Parque Espana' by Giancarlo Mazzanti
Source: Lotus 2014, Photographer Paul Smith

Case Study 1: 'Biblioteca Parque Espana' by Giancarlo Mazzanti, Columbia

This project gives an example of the type Architecture that has been implemented within a disenfranchised community similar to Diepsloot. Giancarlo Mazzanti says, "As architects, the challenge is to develop projects that are able to bring about social inclusion; the challenge does not lie solely in constructing buildings in degraded zones, but in the way it is done, in making sure that they are capable of promoting new forms of use and a sense of belonging and pride in the community." lotus 2014:69.

Looking at Columbia, one of the Latin American countries, afflicted with grave social problems, linked to drug trafficking, economic inequality and corruption. The metropolis engaged a programme of architectural and urbanistic interventions in the most degraded areas, Lotus (2014).

The Administration proposed the use of a programme called Medelin, which emphasised education and culture as drivers of social development, by using design as a means of social transformation and creating centres of reference for community

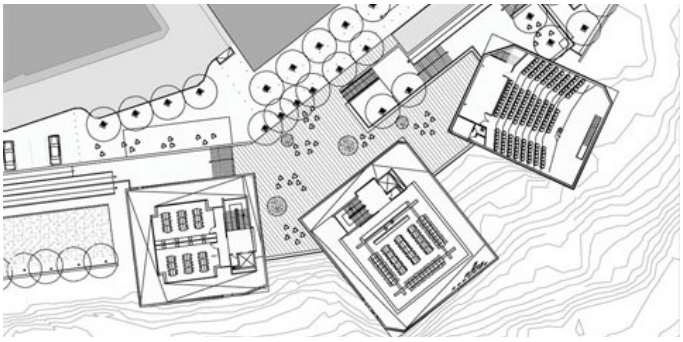


Image 5, Biblioteca Parque Espana' by Giancarlo Mazzanti, plans showing a.auditorium building, b.office and training rooms, c.library
Source: http://www.eikongraphia.com/images/mazzanti/biblioteca_parque_espana_giancarlo_mazzanti_7_S.jpg

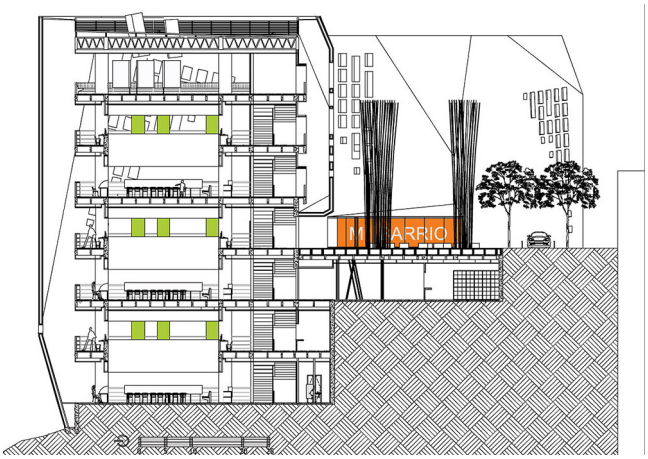


Image 6, Biblioteca Parque Espana' by Giancarlo Mazzanti, Section
Source: http://www.eikongraphia.com/images/mazzanti/biblioteca_parque_espana_giancarlo_mazzanti_7_S.jpg

Image 2:Biblioteca Parque Espana' by Giancarlo Mazzanti, image showing hill top positioning re-emphasising the project as an icon.
Source: Eikongraphia , Photographer: Sergio Gomez

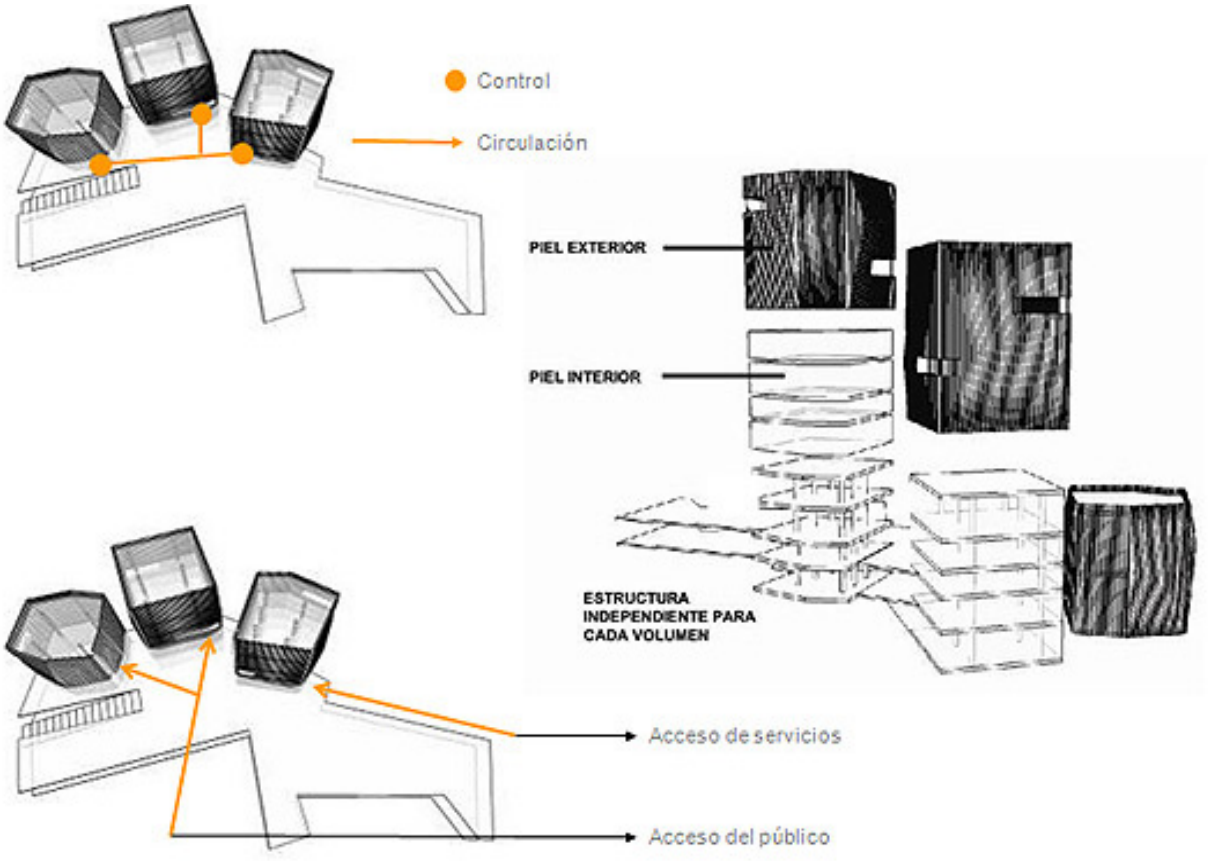


Image 3 Biblioteca Parque Espana' by Giancarlo Mazzanti, image showing structure and cladding
Source: Eikongraphia , Photographer: Sergio Gomez http://www.eikongraphia.com/images/mazzanti/biblioteca_parque_espana_giancarlo_mazzanti_7_S.jpg

Image7, Biblioteca Parque Espana' by Giancarlo Mazzanti, image showing the rocklike forms
Source: http://www.eikongraphia.com/images/mazzanti/biblioteca_parque_espana_giancarlo_mazzanti_4_S.jpg, Photographer: Sergio Gomez

Image 8, Biblioteca Parque Espana' by Giancarlo Mazzanti, image showing the rocklike forms
Source: http://www.eikongraphia.com/images/mazzanti/biblioteca_parque_espana_giancarlo_mazzanti_4_S.jpg, Photographer: Sergio Gomez

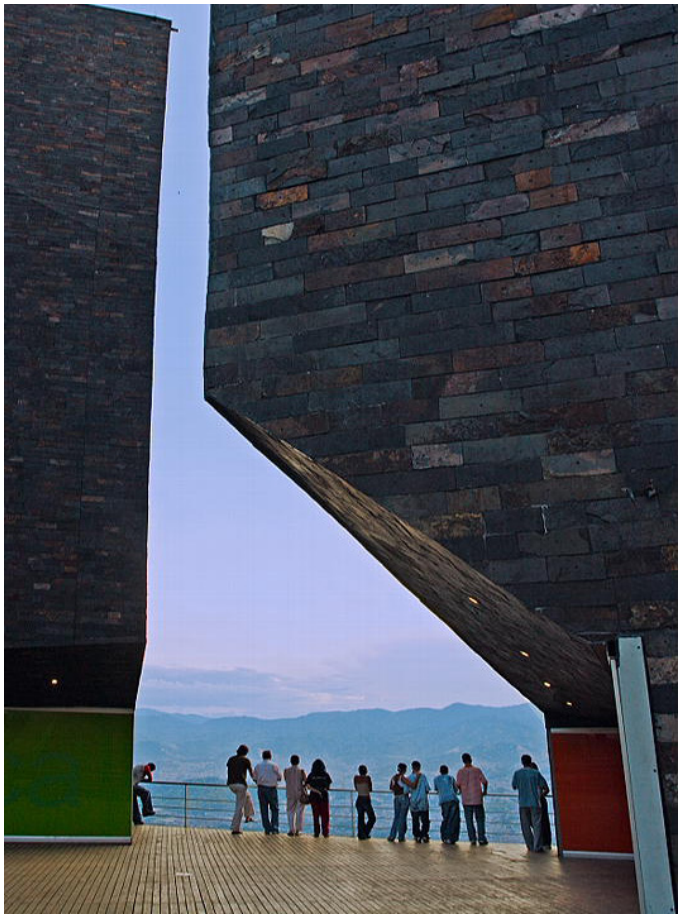


Image 9, Biblioteca Parque Espana' by Giancarlo Mazzanti, image showing the rocklike forms

Source: http://www.eikongraphia.com/images/mazzanti/biblioteca_parque_espana_giancarlo_mazzanti_4_S.jpg, Photographer: Sergio Gomez

and places of social integration.

The brief translated to creating mixed schemes, capable of integrating the functional programme of school and other services open to community, in order to guarantee more open use of the structures 24 hours daily, all year round. The challenge was combining protected school-type spaces with public-type services.

This was very successfully achieved by Giancarlo, as illustrated in image 1 and 2; Iconographically this is achieved by his use of scale and colour, contrasted by the surrounding site

The use of cost-effective natural stone tile cladding illustrated in Images 3 and 4, which provides the robust and hardy look. Security concerns have been addressed by the use of single controlled access points and vertically, adding to the levels of privacy and access restrictions, as illustrated in Images 5 and 6.

The programme is sectioned into, the library, the training and administration rooms and the auditorium, illustrated in Image 5. These were adjoined by the platform illustrated in Image 7, which is said to allow flexibility and autonomy, thus improving user participation, as each operates independently

The design also employed the idea of architecture as landscape, "showing the unknown directions of the irregular mountain contours, not like a metaphor, but like an organization of the form in the place, a folded building cut like the mountains."Archdaily 2008.

As the Biblioteca provides an example of development within a socially challenged community, the next case study will be used to investigate how a hybrid programme of market, agriculture and retail has been explored elsewhere in Latin America.

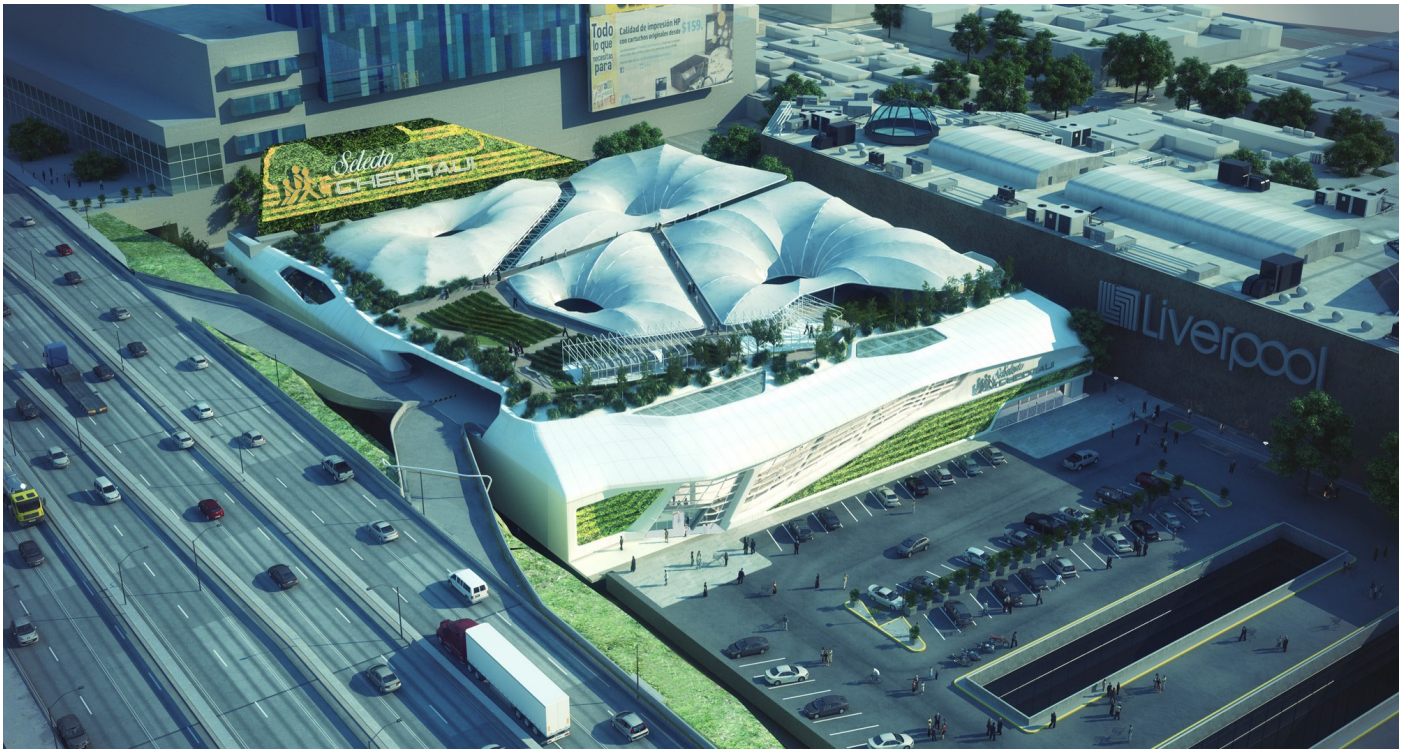


Image 10 ,Chedraui Supermarket Store in Santa Fe, Mexico City ,Rojkind Arquitectos
Source :Arch daily, render by Glessner Group http://www.archdaily.com/432080/chedraui-santa-fe-rojkind-arquitectos/5243b4cbe8e44eff02000115_chedraui-santa-fe-rojkind-arquitectos_2011032_chedraui_drawings_secci-n_c_c-png/

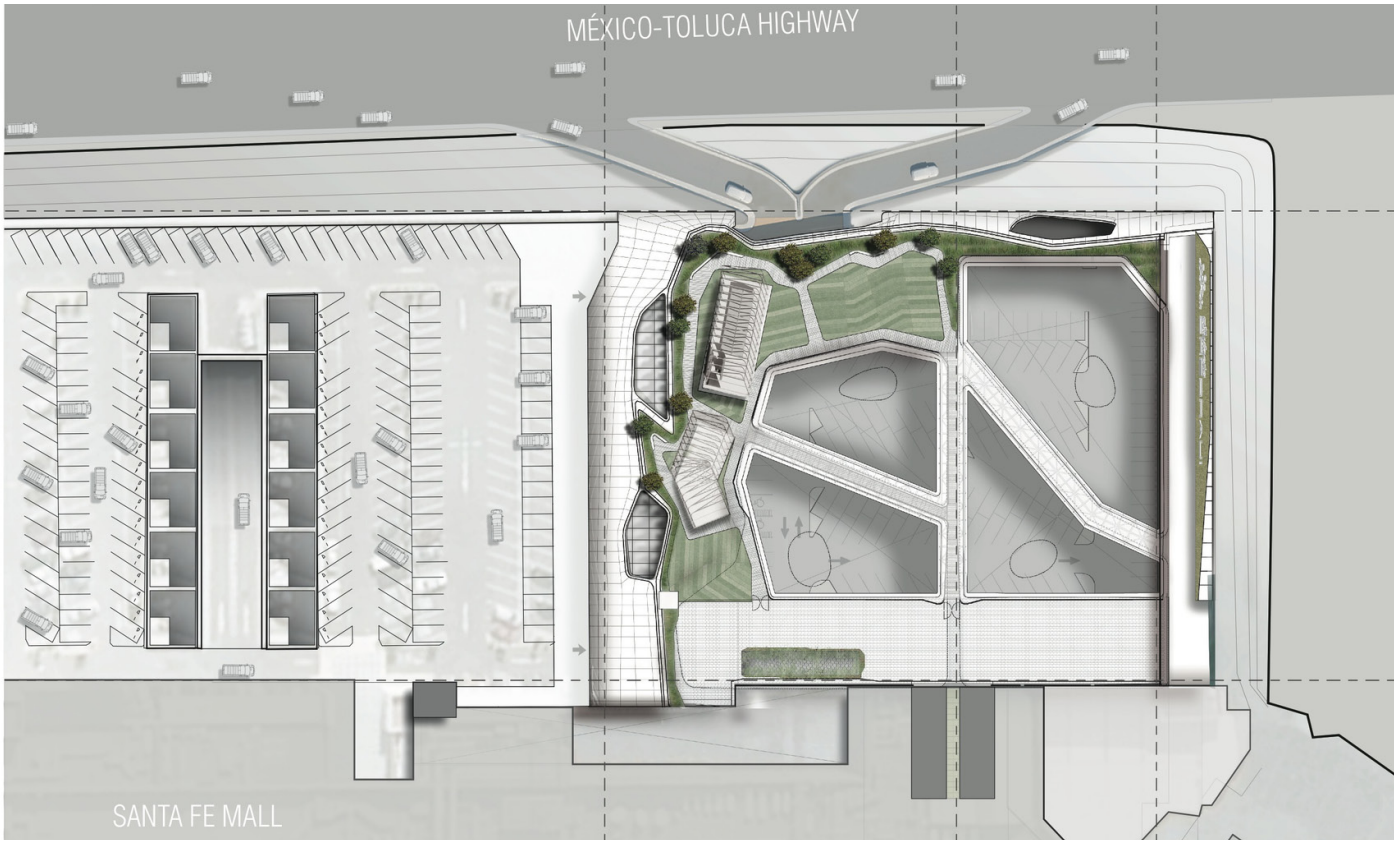


Image 9, Chedraui Supermarket Store in Santa Fe, Mexico City ,plan showing rooftop parking and orchard
Source :Arch daily, render by Glessner Group
http://www.archdaily.com/432080/chedraui-santa-fe-rojkind-arquitectos/5243b4cbe8e44eff02000115_chedraui-santa-fe-rojkind-arquitectos_2011032_chedraui_drawings_secci-n_c_c-png/

Image 10 ,Chedraui Supermarket Store in Santa Fe, Mexico City, image showing rooftop parking and produce vendors
Source :Arch daily, render by Glessner Group, http://www.archdaily.com/432080/chedraui-santa-fe-rojkind-arquitectos/5243b4cbe8e44eff02000115_chedraui-santa-fe-rojkind-arquitectos_2011032_chedraui_drawings_secci-n_c_c-png/

Image 11, Chedraui Supermarket Store in Santa Fe, Mexico City, image showing rooftop orchard
Source: Arch daily, render by Glessner Group,http://www.archdaily.com/432080/chedraui-santa-fe-rojkind-arquitectos/5243b4cbe8e44eff02000115_chedraui-santa-fe-rojkind-arquitectos_2011032_chedraui_drawings_secci-n_c_c-png/

Case study 2: Chedraui Supermarket Store in Santa Fe, Mexico City, Rojkind Arquitectos

The supermarket illustrated in Image 8, is designed with the aim of producing an interactive and educational programme and forming connections with the local markets and a place for the community. The company`s brief attempted to offer something other than just grocery and goods, as well as trying to position the brand in an innovative way, by providing a unique experience to its customers, whilst handing a public space back to the city. The store has roof top parking that can park 250 cars and a 3128m² orchard illustrated in Images 9, 10 and 11, on the terrace level that is accessible directly from the store.

Customers are able to learn directly about organic farming, local farmers have an allocated space to sell their goods, illustrated in Image 10, thus adding to the diversity of products offered by the supermarket.

This orchard illustrated in Image 11, is also envisioned as a recreational or refuge space for the local office workers and residents, away from the motorised environment, as there is a lack of public spaces in the area.

The façade illustrated in Image 12, is composed of fibreglass, reinforced concrete panels, which gives the store a dynamic signature, in contrast to the typical retail fabric that exists in the neighbourhood.

Four large tensile structures illustrated in Image 13, shelter the parking area and the pathways to the orchard, according to Jordana, 2013.
The Chedraui Supermarket Store offers Micro retailers the chance to symbiotically coexist with the Macro retail component in the same vicinity, while offering a less functional and recreational component and the clear separation of spaces, though spatially linked with controlled links, assures security. Material use directly reflects function, with the hard forms associated with the functional, formal and the softer forms with the recreational, as illustrated in Image 14. The following case study explores retail development proposed for a city in Ethiopia.

Image 12 ,Chedraui Supermarket Store in Santa Fe, Mexico City, image showing facade
Source :Arch daily, render by Glessner Group, http://www.archdaily.com/432080/chedraui-santa-fe-rojkind-arquitectos/5243b4cbe8e44eff02000115_chedraui-santa-fe-rojkind-arquitectos_2011032_chedraui_drawings_secci-n_c_c-png/

Case study 3: Proposed Shopping mall typology, Xavier Vilalta, Addis Ababa in Ethiopia

In Africa, a new typology was developed by Italian architect Xavier Vilalta for a retail development in Addis Ababa in Ethiopia.

Existing malls are characterised by the development similar to the one above, which according to Vilalta, are a failure, because the square meterage of the shops is too large. This forces the rentals to be too high and generally not affordable. The architecture of glass is inappropriate for the climate, resulting in high energy demands to cool the buildings, as well as these structures not reflecting local culture.

His design approach was to investigate how the organised structure housing the vendors functioned in response to consumer behaviour.

He also noted how the public outdoor space seemed to create activity and, through site analysis, the study of movement patterns. He designed a building that would simulate the outdoors with a diagonal atrium space, around which smaller vendor-sized shops would be located and on the ground floor, created a much needed diagonal connection between the streets.

The study of the embroidery patterns of local textiles , informed his perforations or openings in the fascade, thus responding to the climate, by letting in air and light in a filtered way. The building is said to be self sufficient, as it harvests water for sanitary purposes, with photovoltaics to power the building and as there is less glass, no air conditioning is employed in the building.

The above case studies summaries show:

- An informal settlement offers a platform for the freedom of form
- A sense of identity and belonging can be achieved by careful consideration of scale
- The choice of cost-effective material that is robust and requires the least maintenance is ideal in an informal settlement
- Spatial used can form the identity of spaces
- Roof gardens can serve both functional and recreational purposes
- Zoning and degrees of privacy contribute to cost-free means of security
- Aesthetically pleasing structures heighten the sense of pride and passively guards against vandalism

In the next Section, the lessons learnt from explorations of the case studies will be used in combination with various other tools, in order to develop and propose the design of the proposed hybrid prototype.

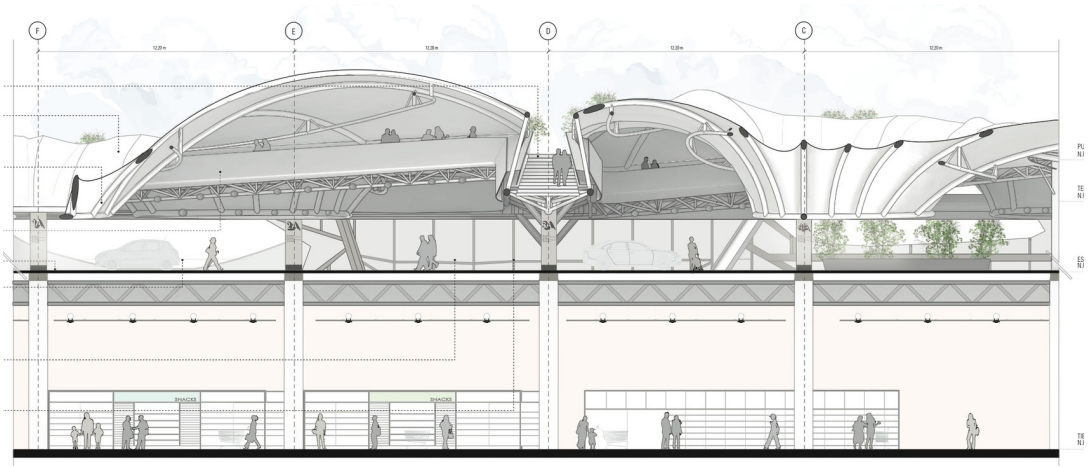


Image 13 ,Chedraui Supermarket Store in Santa Fe, Mexico City, section showing tensile structure detailing
Source: Arch daily, render by Glessner Group, http://www.archdaily.com/432080/chedraui-santa-fe-rojkind-arquitectos/5243b4cbe8e44eff02000115_chedraui-santa-fe-rojkind-arquitectos_2011032_chedraui_drawings_secci-n_c_c-png/

Vilalta, X. 2013, image showing typical Ethiopian building
Source : Ted Talk 2013, photographer unknown

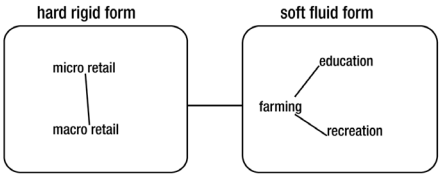
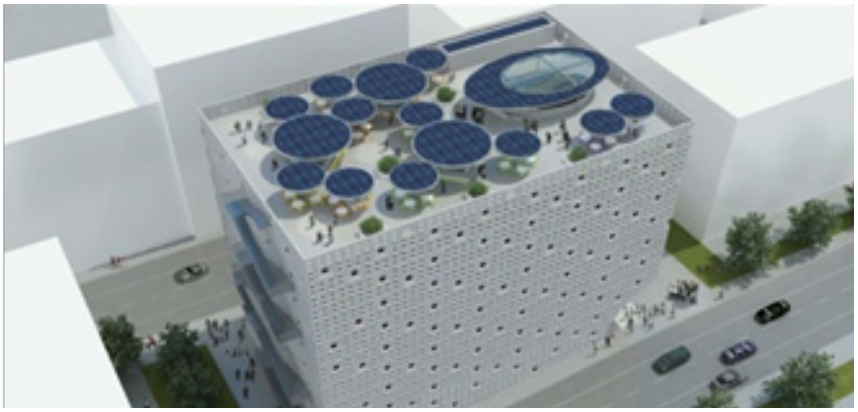


Image 14, relationships between form and funtion, by Author

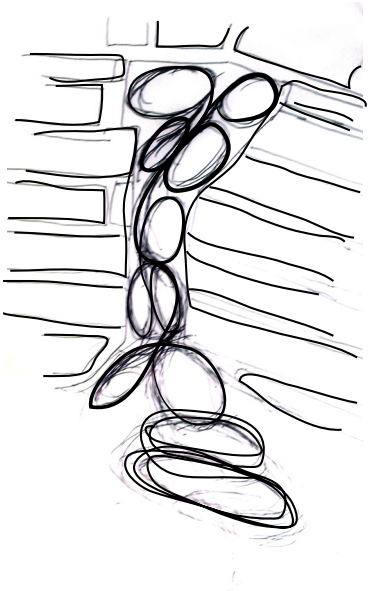
Vilalta, X. 2013, image showing typical Ethiopian market
Source : Ted Talk 2013, photographer unknown

Vilalta, X. 2013, image showing site analysis and planning
Source : Ted Talk 2013, photographer unknown

Vilalta, X. 2013, image showing interior and lighting
Source : Ted Talk 2013, rendere unknown



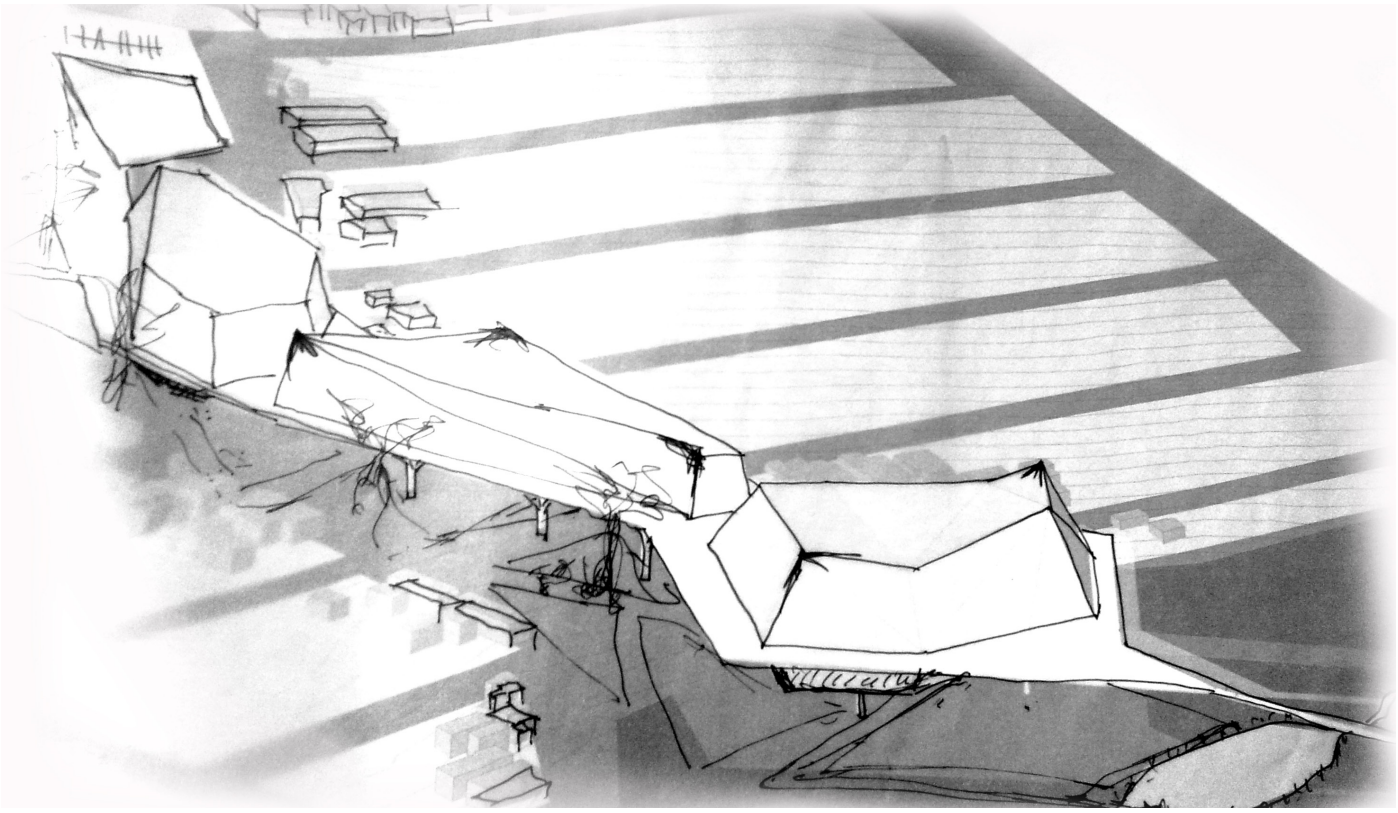
Vilalta, X. 2013, image showing photovoltaic panels, concrete skin with perforated openings
Source : Ted Talk 2013, photographer unknown



Sketch 1:Intitial Site Layout
Source: Sketch by Author

Sketch 2:Green Space mapping
Source: Sketch by Author

Sketch 3:Wetland reclamation
Source: Sketch by Author



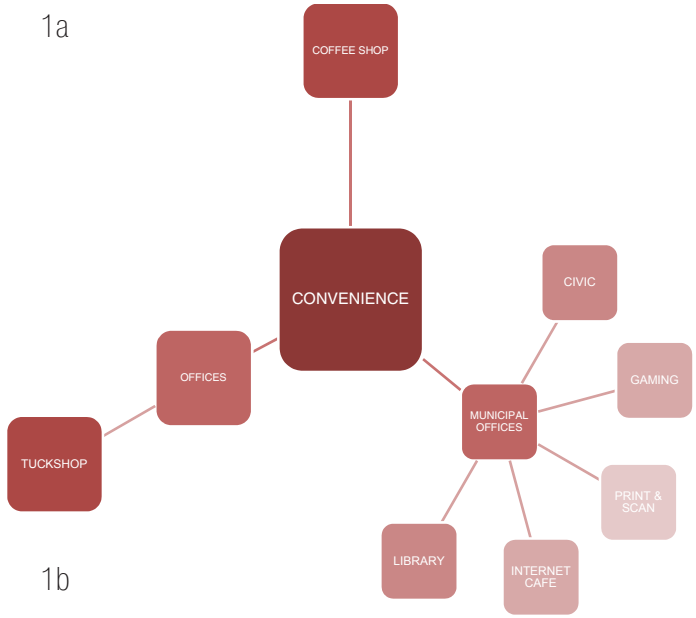
Sketch 4:Programme cantilleveing over site
Source: Sketch by Author

Initial design attempt was targeted at developing the entire economic node. With the main retail anchors being clearly defined and laid out in a fragmented arrangement, held together by micro retailers strung-in like beads on a path threading between the macro retail facilities.

Sketch 1 illustrates the initial sketch of macro retailers held together by a string of micro retailers, sketch 2 further illustrates how these macro retailer could be split into departmental stores creating more space for micro retailers to inhabit the in-between left over spaces creating a symbiotic relationship between the two, as bulk retail customers would constantly interact with micro retailers on route thereby passively marketing the micro retailers product.

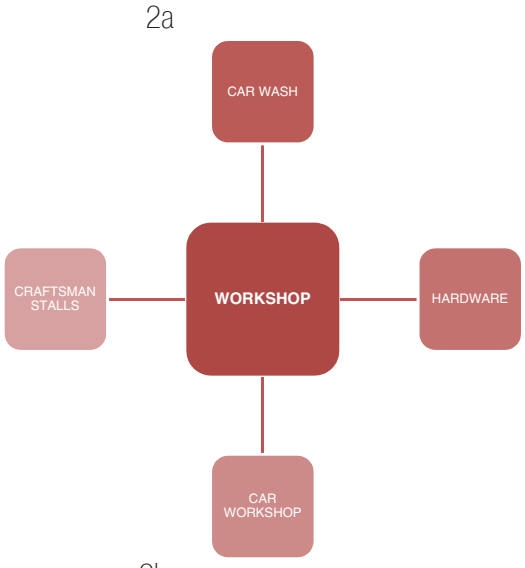
Closer analysis into the different micro retails that already existed in Diepsloot , allowed for the identification and classification to the different type of retailers who would inhabit the space, their spatial requirements where closely examined and documented and illustrated in table 1.

The main types of stores could be coupled with the relevant micro retail type as a compliment as illustrated in table 1. Convenience type stores could be located close to the office typology, these would be supported by the micro retailers that facilitate the day to day running of their establishments, these include printing and scanning, internet café, coffee shops and otherwise recreational gaming as diagrammed in the A diagrams. Spatial relations could manifest in the different

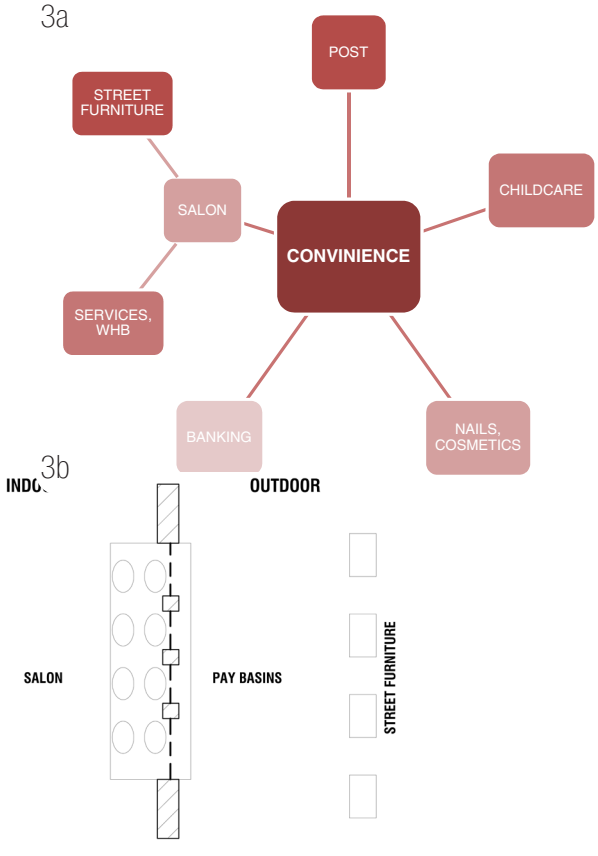


SYMBIOSIS-SHOP WITHIN OFFICE, SHOP ON THE GO,

SYMBIOSIS-CIVIC COURTYARD WITH PODS WITHIN THE SPACE



SYMBIOSIS-COUNTER WITHIN THE SHOP, COMMUNAL WORKSHOP



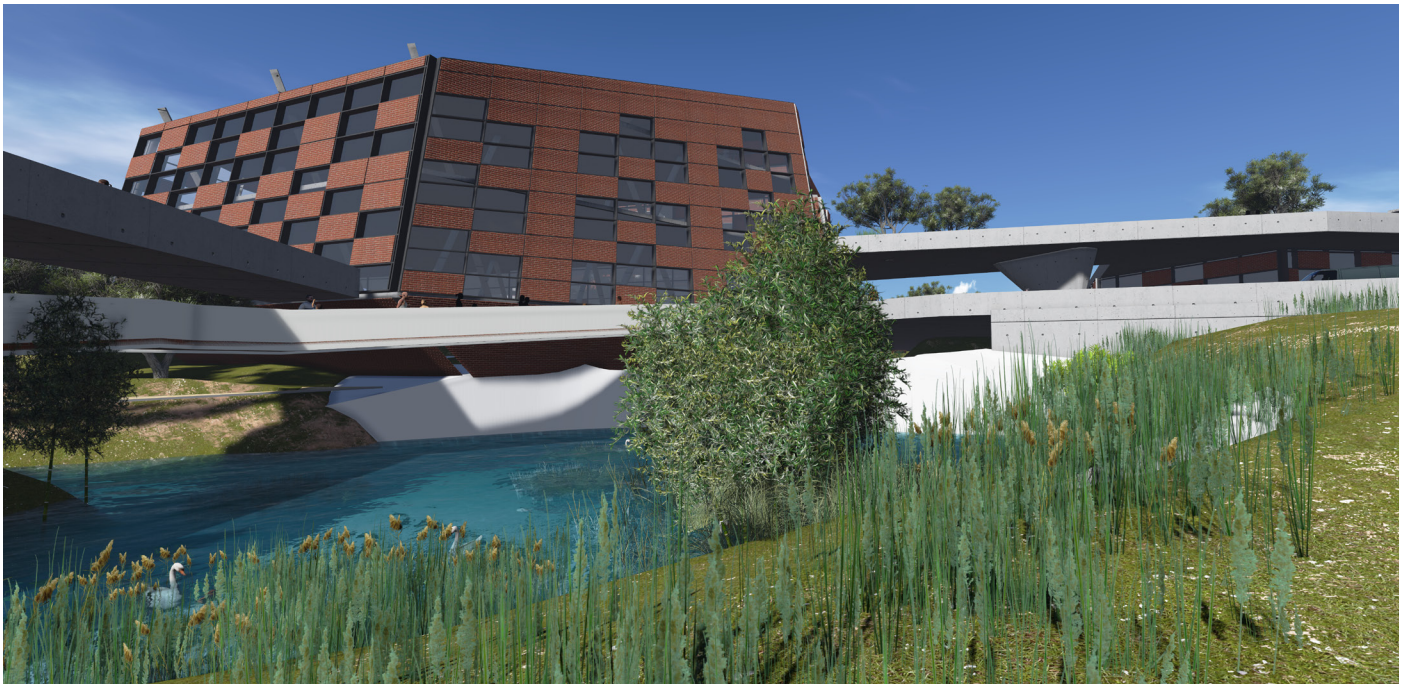
SYMBIOSIS-SHARED SERVICES

SYBIOSIS-COOKING MARKETS WITHIN MARKET SPACE

Table 1:Analysis of symbiotic relationships
Source: Sketchs by Author

relations as illustrated in the B diagrams, for instance, large canteen shop, whose coffee could be supplied by a micro retailer, gaming pods rentable by individuals in public spaces, hardware workshop and stores, with rentable workspace facilities available to craftsman displaying their samples on street spaces, pay stations for beauty sanitation retailers or rentable cooking stations in courtyard spaces to food supplier stores. Render images 1 and 2 illustrate how the envisioned retailers would take over the in-between spaces.

Render 1:Stormwater Cleansing System
Source: Render by Author



Render 2:Stormwater Cleansing amenity/ Recreational Facility
Source: Render by Author

The entire programme was envisioned as being cantilevered over the wetland as a pedestrian bridge between the disjointed neighbourhoods within Diepsloot as illustrated in sketch 3.
At the natural ground level, the wetland would be reclaimed, with pedestrian connections horizontally across the wetland established as well .Storm water would be treated through a series of cleansing ponds and its target destination would be a water reservoir that could either be used as a fish farm or used to irrigate proposed agricultural plots before it is released back into the wetlandas as illustrated in sketch 4 and render 4 .

The wetland would also provide an upgraded community recreational facility as illustrated in Render 5.
Fesibility of this entire development was explored by examining a case study in which micro retailers were accommodated into the commercial development fabric in Kagiso is discussed below.

Case Study: Kagiso mall
Architect: KMH Architects
QS : MLC Quantity Surveyors
Client : Old Mutual investment group ,Property investments

Images 1-5:Kagiso Context
Source: KMH Architects

Images 6-12:Kagiso Mall images
Source: KMH Architects

The Project

Kagiso is a township located in Krugersdorp. It has a population of 190 000, with residents ranging from low to medium earners, with a fix of RDP and informal housing.

The community had an existing mall which had since become poorly maintained and was loosing tenants due to the state of the mall. Old Mutual investment groups already owned the mall and had their primary intentions set on redeveloping it

As Kagiso is a township, the brief formulation included consultation with old Mutual whose primary intent was to renovate the mall to provide a better shopping experience and improve their tenant mix and encourage tenants to renew their leases and increase their rentals and subsequently turn overs. The group released a functional brief which was aimed at consolidating and conveying the client`s functional and technical requirements to the professional team as well as set out procedural and development processes that are to be followed in managing the project to completion.

Site & Context

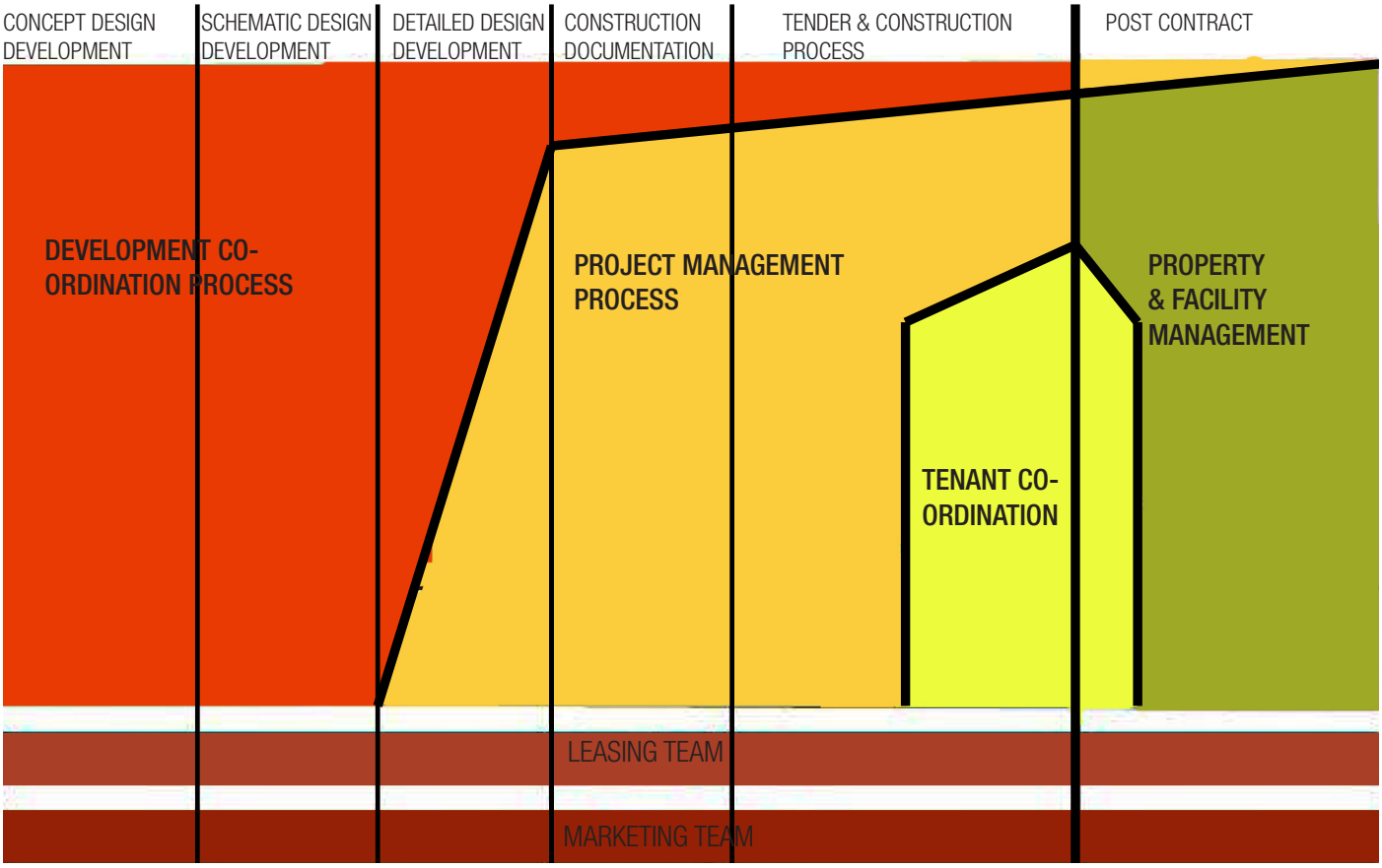
Images 13-19:Kagiso Mall Context
Source: KMH Architects

SCHEDULE "A"

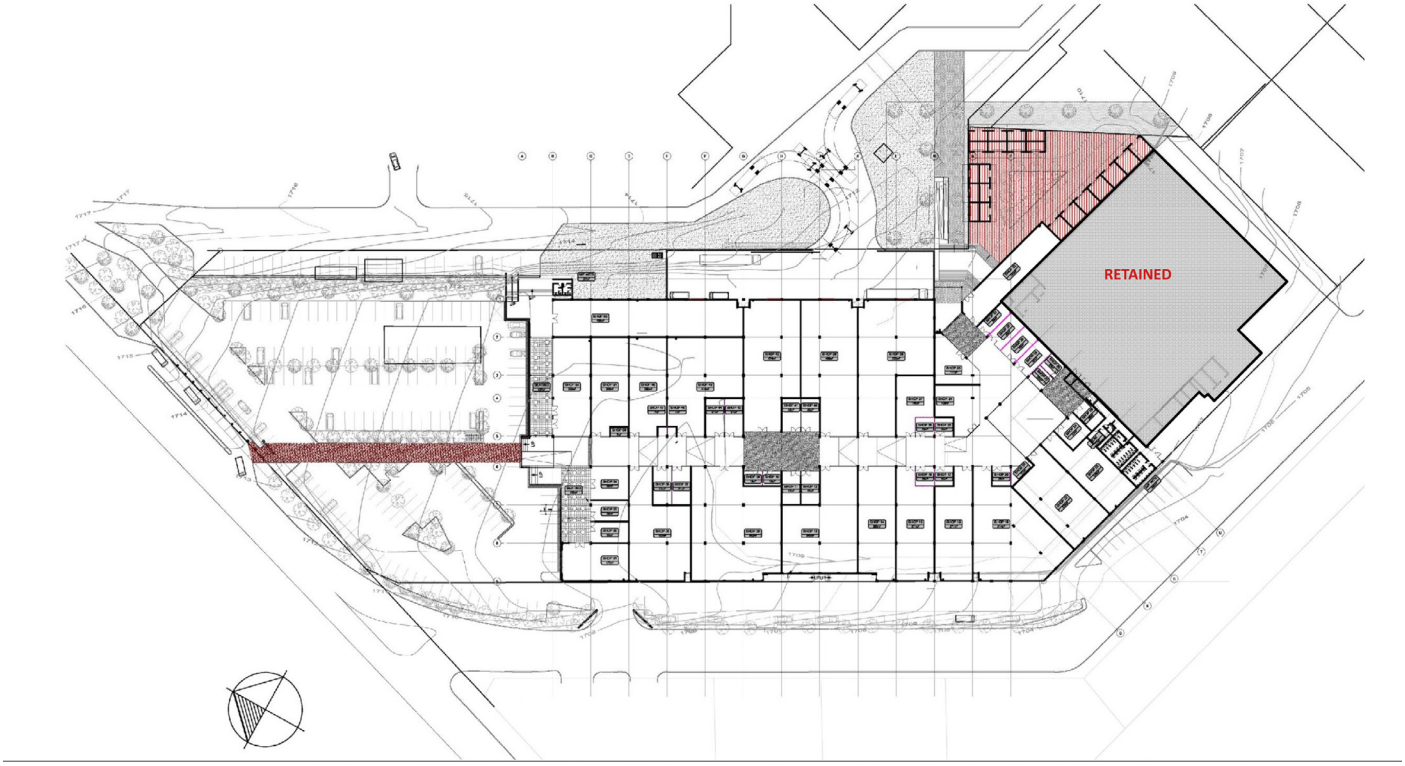
EXECUTIVE SUMMARY - ESTIMATED CAPITAL COST
SOFT ROOF OPTION

LAND COSTS			
Land costs including legal costs in connection with transfer, etc.		R	5,400,000
IMPROVEMENT COSTS (REFER SCHEDULE "C")			
Estimated improvement costs including contingency, escalations and fees			115,628,000
GENERAL COSTS AND CAPITALISED INTEREST (REFER SCHEDULE "D")			
General costs and capitalised interest			18,479,000
CAPITAL COST INCLUDING VALUE ADDED TAX		R	139,507,000
VALUE ADDED TAX INPUT CREDIT			
Input tax credit in respect of Value Added Tax on improvements and taxable general costs (excluding land)			(15,697,000)
CAPITAL COST AFTER VALUE ADDED TAX CREDIT		R	123,810,000
NET FIRST YEAR INCOME		R	11,719,000
NET FIRST YEAR RETURN (BEFORE TAX)			9.47%
CAPITAL COST EXPRESSED AS A RATE PER SQUARE METRE OF RENTABLE AREA	10,038 m² at	R	12,334.13

Cost Estimate Reoprt
Source: MLC Quantity Surveyors



Retail Development Process
Source: MLC Quantity Surveyors



Kagiso Mall plan
Source: MLC Quantity Surveyors

Micro Retailers Rental Spaces
Source: KMH Architects

The process also included consultations with the mayor of Kagiso, from which the need for a community oriented redevelopment was defined. It was require that the design incorporate informal or hawker's kiosks as a means of integrating small entrepreneurs within the commercial retail development environment.

The design was limited to the above mentioned list which sums up to building and basic services. The rest where left for the tenants to develop as per their requirements. As there were budgets for all elements, the design and choice of materials where limited to the allocated budgets. Operationally Old Mutual property division manages the mall .
Implementation
A feasibility study was conducted by a QS ,MLC quantity surveyors from which costs where established and affordable tenant spaces where allocated.

Old Mutual undertook to fund the entire development. And they contracted KMH as the architects. An invitation to tender for construction was issued to a select group who had previously worked with the group on other projects was put out, and Probest Contractors one the tender.

Part of the brief was to design for the young emerging market and also create a balance with the old and more traditional market, in response KMH looked to the heritage aspects of the community for design inspiration. Also, consulted with the Hawker`s association to establish their spatial requirements.

Part of the existing mall was demolished and the existing Shoprite retained.

A business plan was then drawn up in order to establish feasibility of the development as discussed in the next section.

8 LEASING FEES :

Leasing fees have been calculated as per Old Mutual Investment Group, Property Investments

9 TENANT ALLOWANCES :

Tenant allowances have been provided in addition to the standard shop allowances, these are set out in Schedule "C"

10 STANDARD SHOP ALLOWANCES :

The following standard shop allowances have been provided :

- floor finish	: screeded floors
- wall finish	: painted finish
- ceilings	: 1200mm x 600mm vinyl covered gypsum plasterboard suspended ceiling on exposed tees, with painted plasterboard bulkhead at shopfront
- electrical	: one 15Amp socket outlet per 35m²
	: open channel fluorescent light fittings to 350 lux
	: single phase connection and distribution board to shops under 500m²
	: 100Amp three phase connection and distribution board to shops over 500m² as well as restaurants
	: one unwired telephone outlet per shop
	: one wired signage outlet per shop
	: one unwired geyser outlet per shop
	: metering to each shop
- plumbing	: single bowl stainless steel wash hand basin with cold water supply only
- air conditioning	: split unit air conditioning to shops
- fire services	: fire protection / detection as required by local authorities

11 EXCLUSIONS :

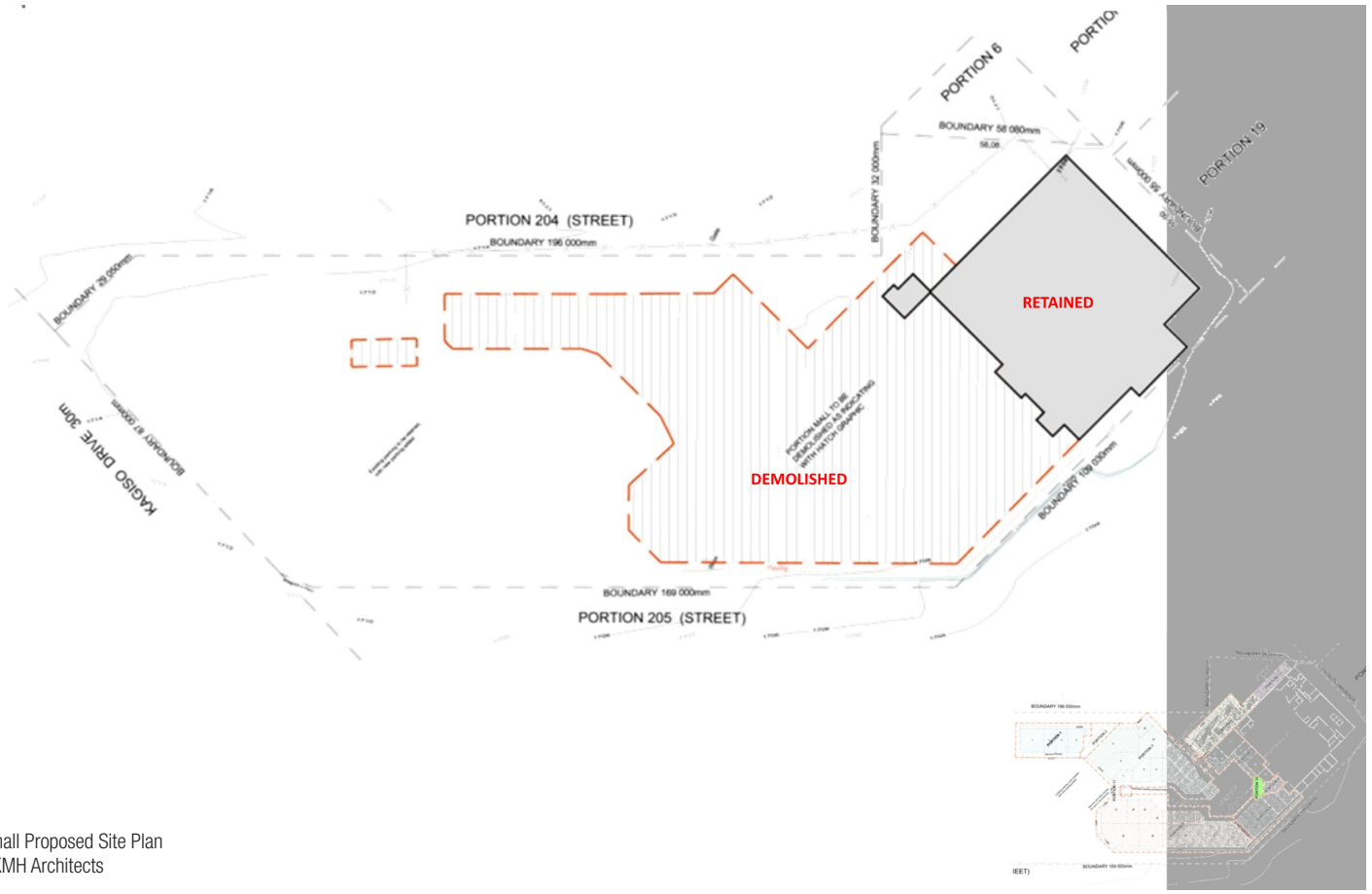
The following are specifically excluded from the estimated improvement costs :

Mechanical and Electrical :
UPS power requirements (assumed paid by tenant if required)
CCTV installation
public address installation
security and access control
vehicle access control and booms
remote metering system
sound sytem installation
broadband installation
refrigeration equipment
building management system

Specialist Equipment :
kitchen equipment to restaurants
operational equipment costs
refuse and waste management
gas installation
parking pay-on-foot system

General :
piling and / or special foundations
all tenants' fixtures and fittings
special tenant's requirements
shadeports
rezoning fees
town planning fees

Cost Estimate Reoprt
Source: MLC Quantity Surveyors



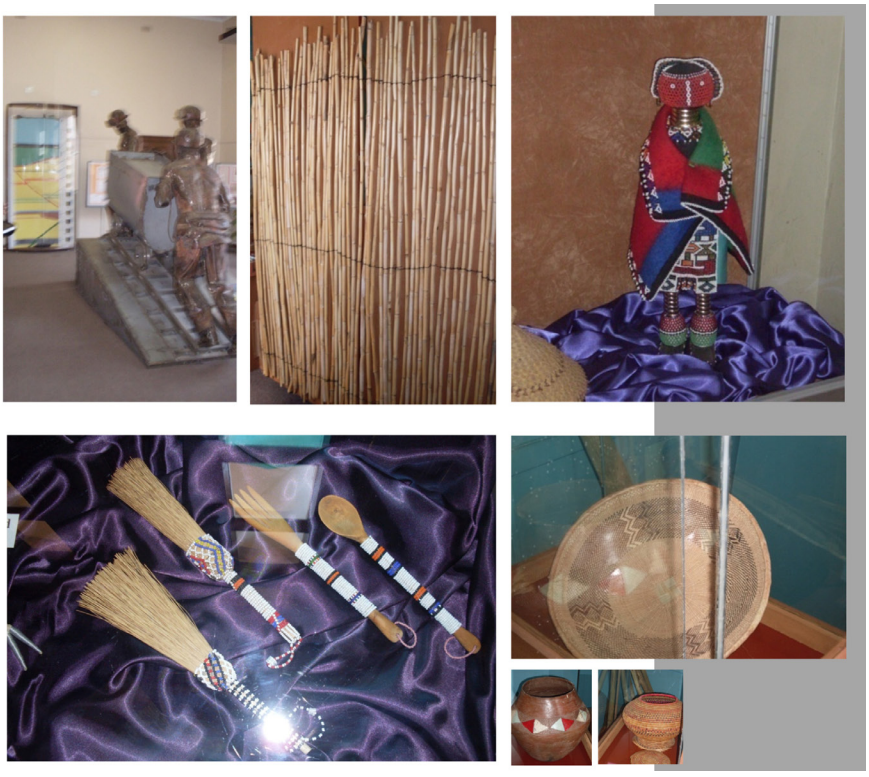
Kaigiso mall Proposed Site Plan
Source: KMH Architects

Photos taken from Mogale City Museum:

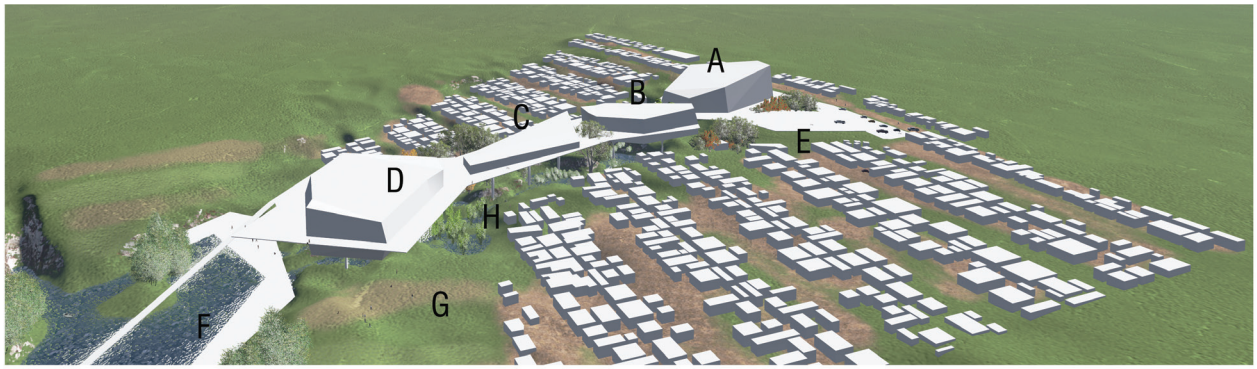
Established in 1920 by ex-miners and squatters from nearby Luipaardsvlei.
By 1950 the number of squatters had grown, spawning the larger Luipaardsvlei and Lewisham township, southeast of Krugersdorp.

The word "Kagiso" means peace in Tswana.

The township is occupied by nearly 190,000 people. Kagiso comprises five wards, each headed by a councillor. Some of the languages spoken there include Tswana, Southern Sotho, Northern Sotho, Xhosa, Tsonga, Venda, and Zulu.



Concept Drivers
Source: KMH Architects



A.SUPERMARKET,CLOTHING,FOOD ANCHOR, B.CONVINIENCE,BANKING,POSTNET, HAIR,BEATY,ELECTRONICS ETC, C. CLINIC, DOCTORS ROOMS, HEALTH AND WELL-NESS, D. MARKET, FRESH PRODUCE,FOOD, E.MOTOR RETAIL, WORKSHOP, CARWASH, DRIVING SCHOOL TAXI RANK F. FISH FARM, G. ORGANIC PRODUCE FARM, H.WATER PURIFUCATION WETLAND

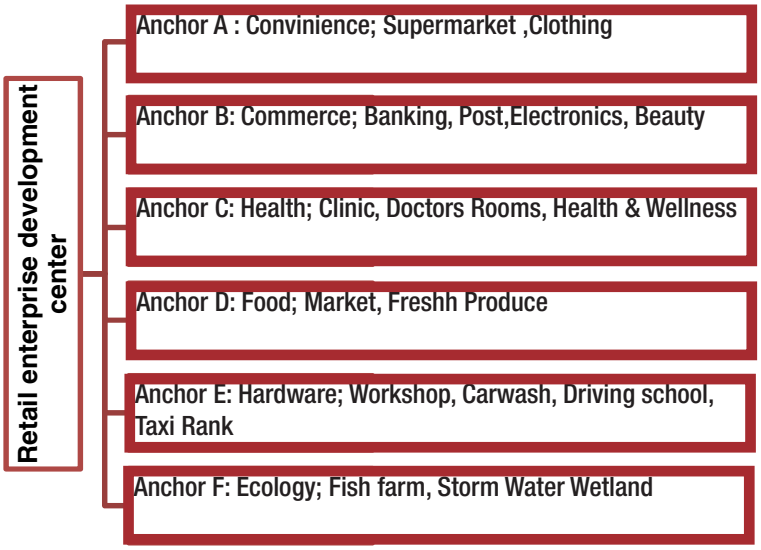


Figure3: Retail anchors
Source: Author

The Business Plan Proposal

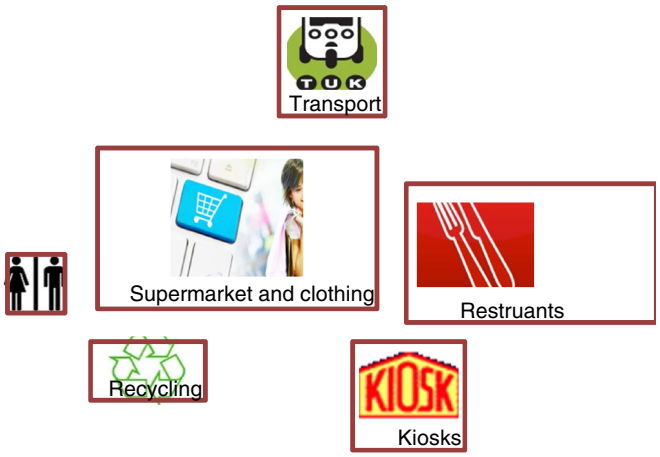
This project aims to respond to the socio-economic and ecological needs of a disenfranchised community simultaneously responding to the commercial needs of the developer. It is targeted at creating a symbiosis between commercial needs, community development, ecological development and job creation. It is in a nutshell, a community oriented commercial development.
The design is intended at creating a tenant mix that accommodates small business enterprises such as hawkers and craftsman with the medium to large business enterprises, all this suspended over a wetland whose recovery and redevelopment as water purification, water education and awareness, organic farming, fish farming and leisure destination which then forms part of the key anchor for the success of this development as a whole.

Diespsoot is characterised with minor roads 6- 8m wide roads, this results in high traffic congestion at all times of the day. The project also proposes a second aspect to try and mitigate the problem of traffic congestion by proposing an offsite parking that will accommodate much smaller vehicles such as tuk tuks. These are proposed to be the main connecting modes of transport within the neighbourhood connecting people to the main parking and at the same time activating the taxi rank as Taxis will only be allowed to ferry residents from their designated ranks. This will also form another self-empowerment tool for the residents.

The Programme

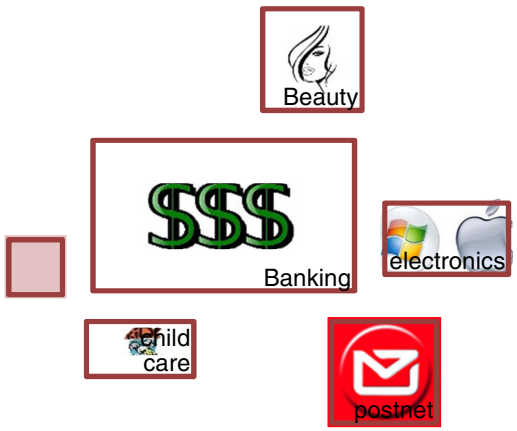
The programme consists of 6 main destination points or anchors which are a dirrect response to the need of the community. These are as illustrated in Figure 3;

Anchor 1: Supermarket, Food and Clothing



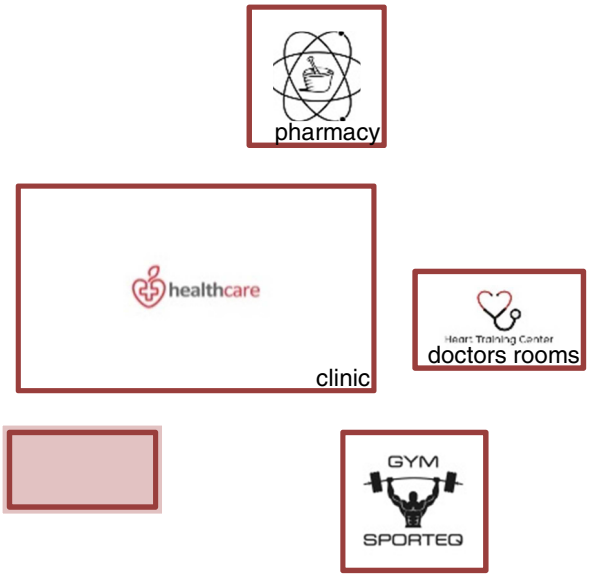
A need for larger retailers is evident, as residents have to travel long distances for their bulk shopping . An efficient door to door delivery system with the tuk tuk would increase shopping convenience and make the centre the better destination spot for shopping.

Anchor 2: Banking and convenience



There is a high demand of banks within this area as there is only one such facility in a community that is heavily dependent on public transport within a 5km radius.

Anchor 3: Health care



Adds to the wellbeing of the community whilst responding to the much needed facility within the community

Anchor 4: Market

The Market, recycling and Entertainment hub offers bulk fresh foods at competitive prices with a guaranteed fresh produce supply by the wetlands project

Anchor 5: Wetlands

This wetland renewal will attract the community and increase foot count through the centre as it offers the leisure component that servers all age groups with its educational boards allowing for efficient use, the organic gardens and fish farm create an additional skill and give the area the unique destination experience as it sells fresh produce

Anchor 6: Workshops

Workshops ranging for locksmiths to Carpenters all with shared facilities for working but different vending kiosks to allow easy consumer identification

The Client

As the retail and community development centre are able to sustain them, and generate profits for the investor,

A Client such as Old Mutual Property investment group is well suited for this task. Old mutual in their property investment manifesto (2011) are dedicated to empowering people, high performance investments within business and employ a planet conscious approach towards a sustainable future.
The IDC (Industrial Development Corporation) and the JDA (Johannesburg Development Agency) would be well suited for the development of the transport and infrastructure network development. The IDC (2013) is committed to providing finance for industrial development projects that promote economic growth. With such sponsorship, some residents will become able to start up their own transportation businesses and by this jobs are created.

The Project

The JDA put out an invite for investors to invest in the area based on the market studies they had carried out they were able to pin point specific areas that needed attention. Factors that clearly influenced this call are likely accountable to a shortage of these amenities in the area. The brief was then formulated not only as a direct response to the call but as a means to try and maintain the existing “High Street” of informal trade , to try and compliment ,develop and improve the business aspirations of the community. At the same time would create more opportunity for commercial use as well as job creation and leisure facility and improving connectivity between the two parts that were separated by the wetland.
Financially, because the project is to be sponsored by a private investor with significant financial abilities, and the ability to wait out until the development pays for itself in the estimated three and a half years, (refer to the Cost estimate section), the budget allows for a robust , structurally stable facility that is self-sustaining, for example recovered excess waste water can be pumped into the wetland reservoir ,Storm water can be harvested and stored also in this reservoir and used for the purposes of organic farming . The reservoir itself can be used as a fish farm. In a way, the budget allows for the creation of a closed loop system. The opportunity to create a closed loop system presented itself in the wetland as illustrated below. Also a chance to create an awareness and educational faucet that allows residents to learn about wetlands, the role they play within an ecosystem creating a consciousness that prevents damping in this area. Similarly, the recycling swop shop encourages or also contributes to the reduction of damping.

The development also offers the chance of creating a more pedestrianized access to both sides of the neighbourhood giving convenient access to the much needed large retail enterprises.

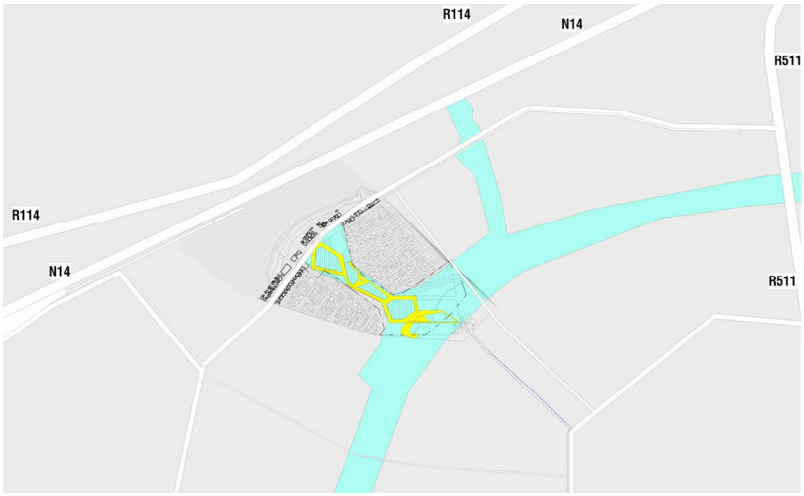


Figure 4 Wetland through Diepsloot
Source: Author

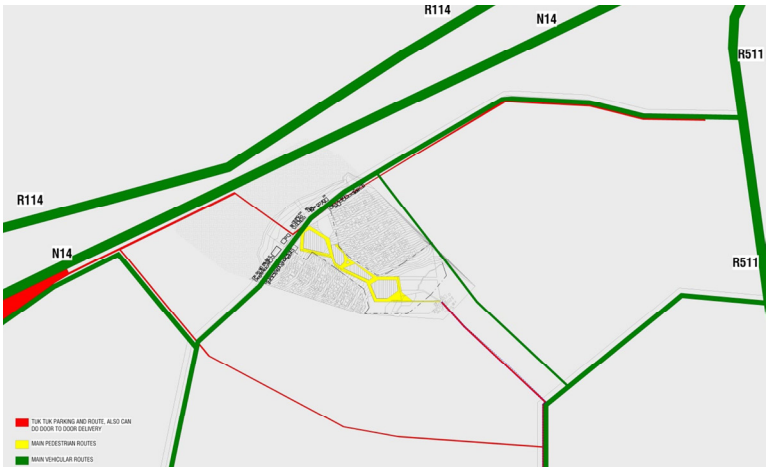


Figure 5: Existing and proposed roads
Source: Author

Accessibility was crucial especially to the residents of Diepsloot, hence located in the heart of the community ,illustrated in Fig. 4 and 5, which also becomes accessible directly from the R511 which according the development of the new toll route, PWV 9, is likely to residential development along the R511 as people are likely to gravitate towards the toll free route. As earlier mentioned an offer site park and ride facility will force the city to improve the current infrastructure as it boosts economic growth.

Operationally, Old mutual insures that the facility is well maintained to insure maximum profitability is achieved. Above is an illustration of how the group manages their properties.

Implementation

With reference to the Cost estimate section, it is estimated that the project will cost R259 638 446.75

According to the South African Council of the Architectural Profession (SACAP) gazetted fee guides as per the Architectural Professions Act No.44 of 2000, a project of less than R307 200 000.00, Architectural fees will be charged at 5.75% with an additional base fee of R807 000. 00. This gives the total Architectural fee of R15 736 210.69. This fee will be invoiced at the end of each work stage; the work stages are divided into six and are outlined as below

Proposed Professional consultant team

Integration

With reference to the Cost Estimate section, it has been illustrated that the proposal can generate a revenue of R79 200 000.00 per annum and should therefore cover the initial capital costs and the operating costs in less than 4 years making it a highly viable project as it not only fulfils the commercial needs of Old Mutual Property Investment Group, but also addresses the much needed interventions within this community.

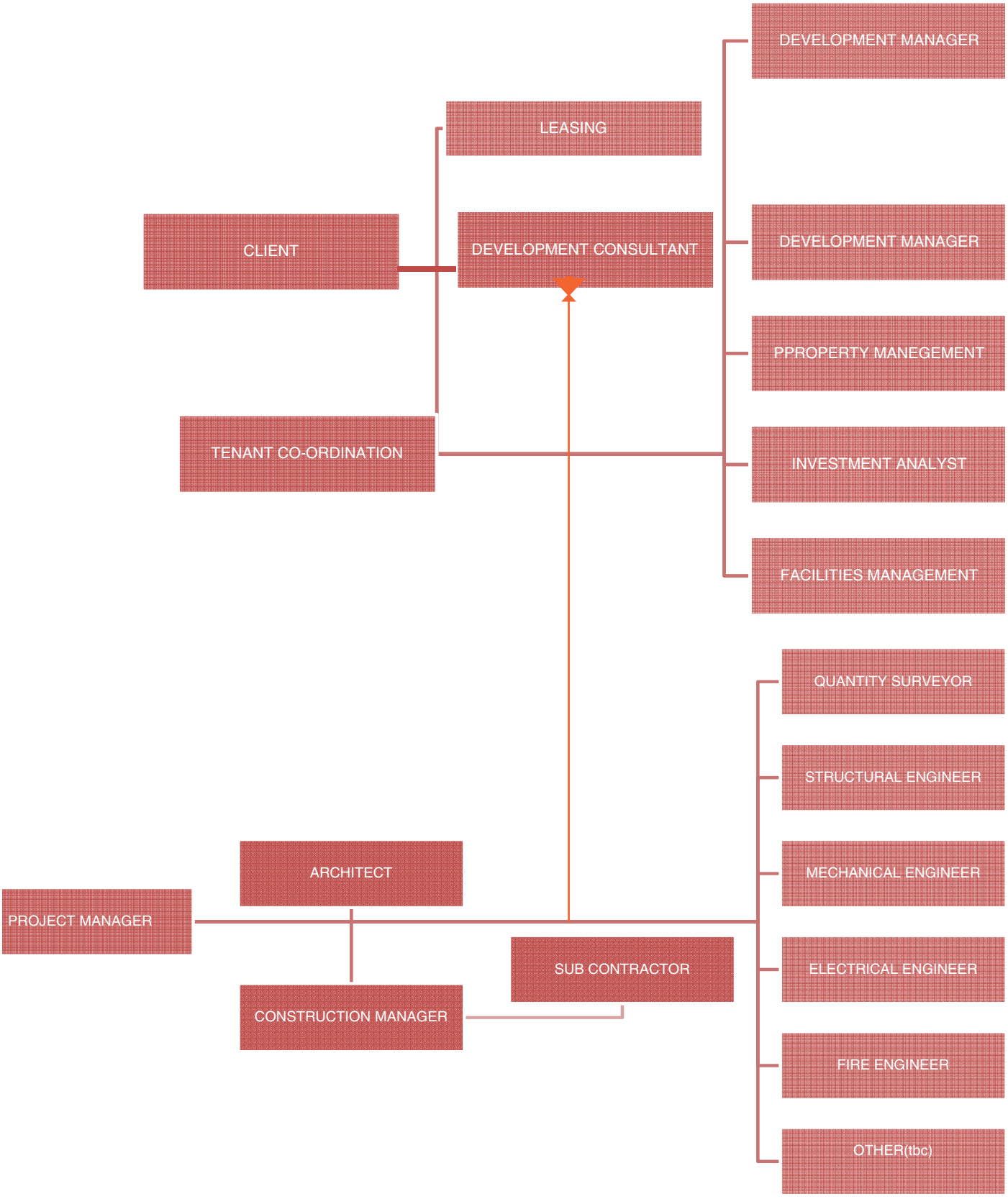
Figure 6: Architect Fee Proposal
Source: Author

Architectural fee of R 15 736 210.69. This fee will be invoiced at the end of each work stage; the work stages are divided into six and are outlined as below,
Proposed Professional consultant team
Integration

With reference to the Cost Estimate (see page 98 - 100), it has been illustrated that the proposal can generate a revenue of R 79 200 000.00 per annum and should therefore cover the initial capital costs and the operating costs in less than 4 years making it a highly viable project as it not only fulfils the commercial needs of Old Mutual Property Investment Group, but also addresses the much needed interventions within this community.

Cost Estimate

	R/m²	Area	Cost
Land Costs	**R120.00**	**45000**	**R5 400 000.00**
Construction Area	**R 4 500.00**	**32000**	**R144 000 000.00**
	R149 400 000.00		
External works			
Landscaping reed beds etc.	R 2 000.00	25000	R50 000 000.00
Tenant allowances			
Clothing and Supermarket	R2 000.00	10000	R20 000 000.00
Clothing and Supermarket	R450.00	4500	R2 025 000.00


DEVELOPMENT MANAGER
LEASING
CLIENT
DEVELOPMENT CONSULTANT
DEVELOPMENT MANAGER
PPROPERTY MANEGEMENT
TENANT CO-ORDINATION
INVESTMENT ANALYST
FACILITIES MANAGEMENT
QUANTITY SURVEYOR
STRUCTURAL ENGINEER
ARCHITECT
MECHANICAL ENGINEER
PROJECT MANAGER
SUB CONTRACTOR
ELECTRICAL ENGINEER
CONSTRUCTION MANAGER
FIRE ENGINEER
OTHER(tbc)

Clinic, Pharmacy& Doctors	R 1 000.00	1700	R1 700 000.00
Market, fruit veg & fish	R 2 000.00	10000	R20 000 000.00
Kiosks	R 150.00	3000	R450 000.00
			R44 175 000.00
			R193 575 000.00

Contingency

Contingency allowance	5% of R193 575 000.00	R9 678 750.00
		R203 253 750.00

Escalations

Estimated Professional fees

Consultants including Project Man.	23%	R45 894 696.75
Estimated development Costs		R249 148 446.75

General costs

leasing Commission	R3 000 000.00
Development fees	R5 000 000.00
Security and cleaning	R500 000.00
Marketing	R400 000.00
Tenant coordination	R300 000.00
Plans Approval	R100 000.00
legal fees	R150 000.00
Advertising boards	R40 000.00
Bulk service- Roads& drainage	R500 000.00
Provision foot counters	R200 000.00
Provision Health and safety Consultant	R150 000.00
Provision Geotec. Invest.	R150 000.00
	10 490 000.00
Estimated Total Costs	**R259 638 446.75**

Income Schedule

Clothing and Supermarket	300	10000	R3 000 000.00
Convenience	200	4500	R900 000.00
Clinic, Pharmacy& Doctors	200	1700	R340 000.00
Market, fruit veg & fish	200	10000	R2 000 000.00
Kiosks	100	3000	R300 000.00
Total Monthly Income			**R6 540 000.00**

Gross Annual Income		R78 480 000.00
Operating costs	R16/m²	R720 000.00
Net First year Income		**R79 200 000.00**
Estimated Period for Capital Recovery		**3.278263217**

The Mall is expected to have paid for itself In about 3.5 years

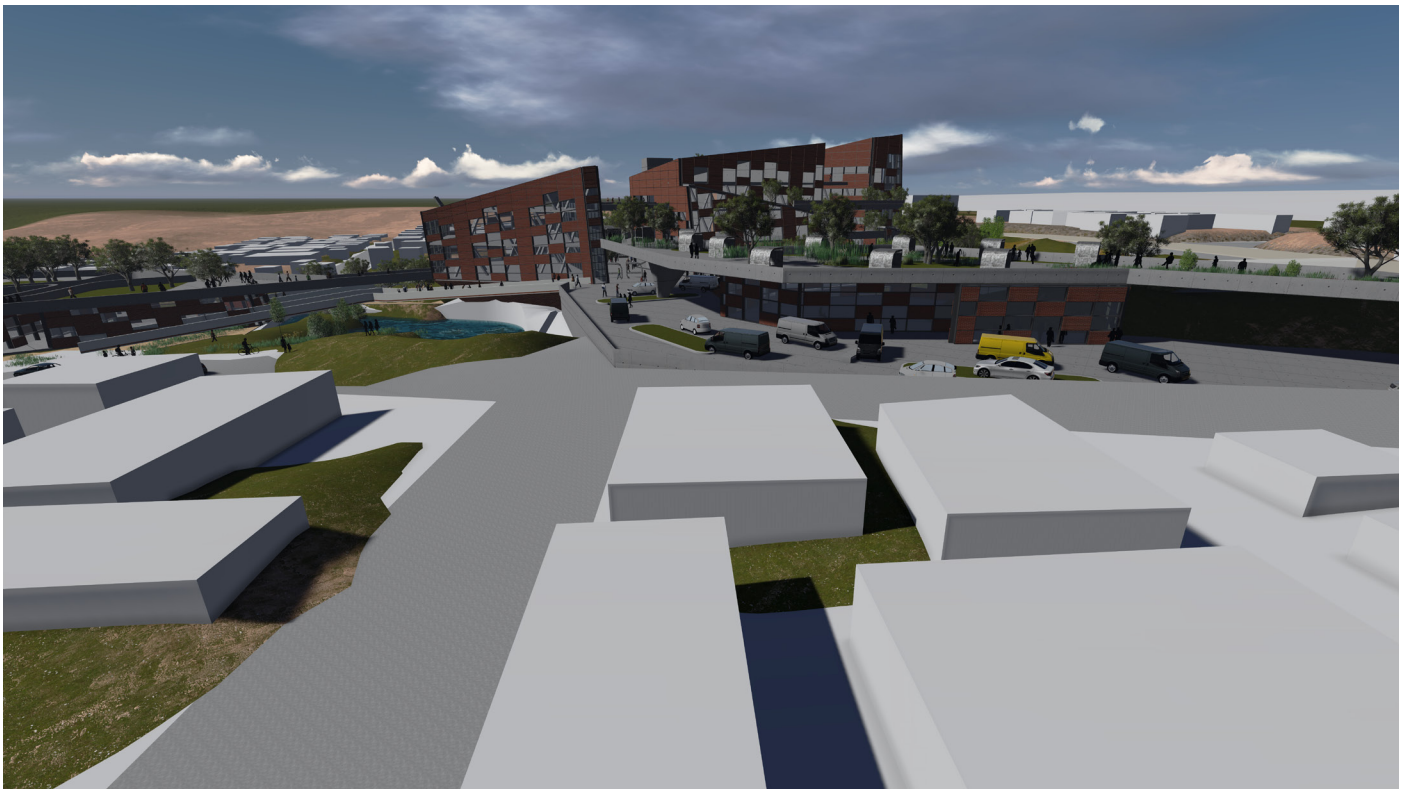


Figure 7: Initial Proposed Vibrant Economic Node
Source: Author

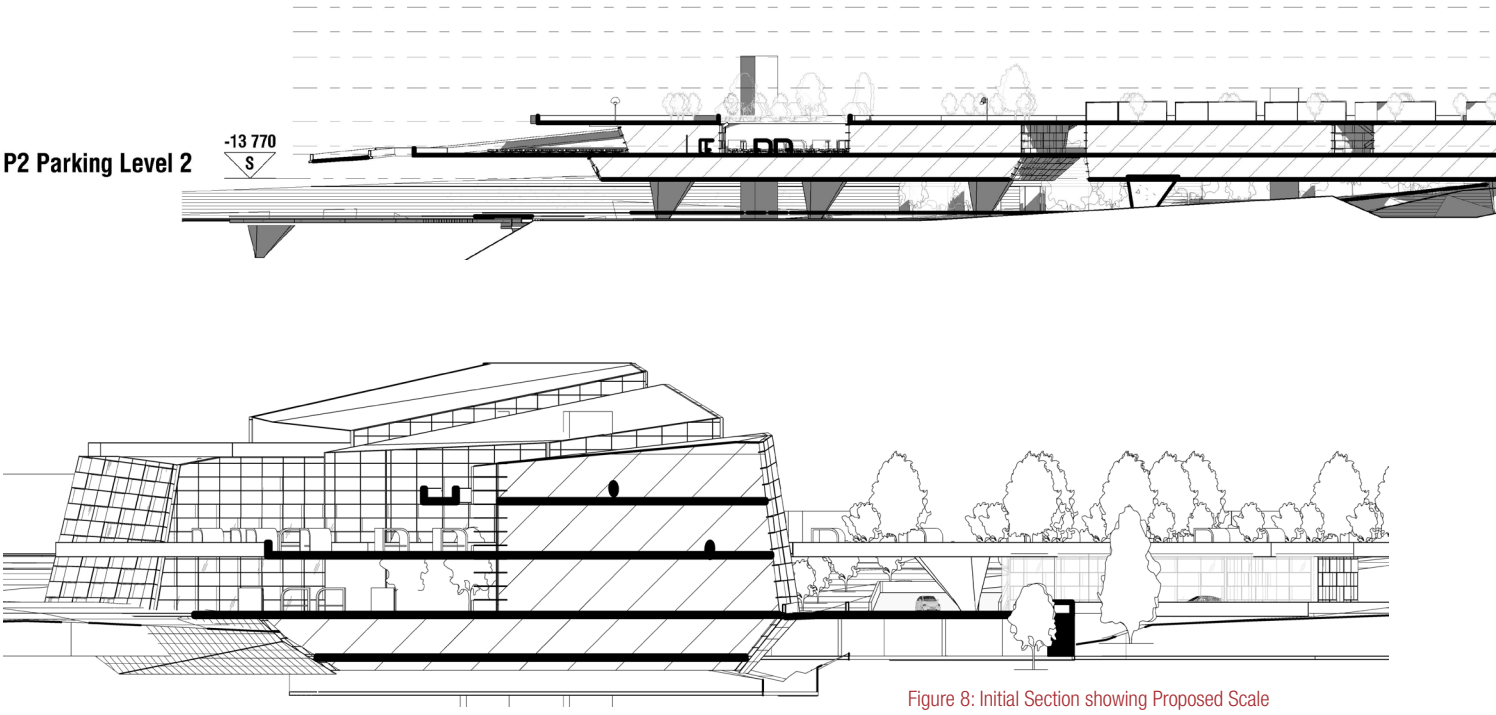


Figure 8: Initial Section showing Proposed Scale
Source: Author

Design Development

The development proved to be a financially feasible as a whole as in less than 5 years, the entire development would have paid for itself.
However this initial design proposal ,illustrated in Figs 7 - 11, potentially posed a high capital input into the structural design, and the sheer scale of it as illustrated in sketch section 6 and render 6 potentially presented an intimidating, authoritative, unfamiliar scale that the community might not interact with in a comfortable manner. The development also proved to have a high square meter age which this thesis would be unlikely to fulfil the design demands given the limited amount of time and resources for the task. A more phased approach, which would not only reduce the demand on initial capital input but also propose a scale that was comfortable and more interactive to the community, was re-structured explored. The wetland reclamation suggested the Food anchor would most likely be the most appropriate anchor to develop as it would immediately activate the use of the water reservoir and prevent it from relapsing in to damping site.

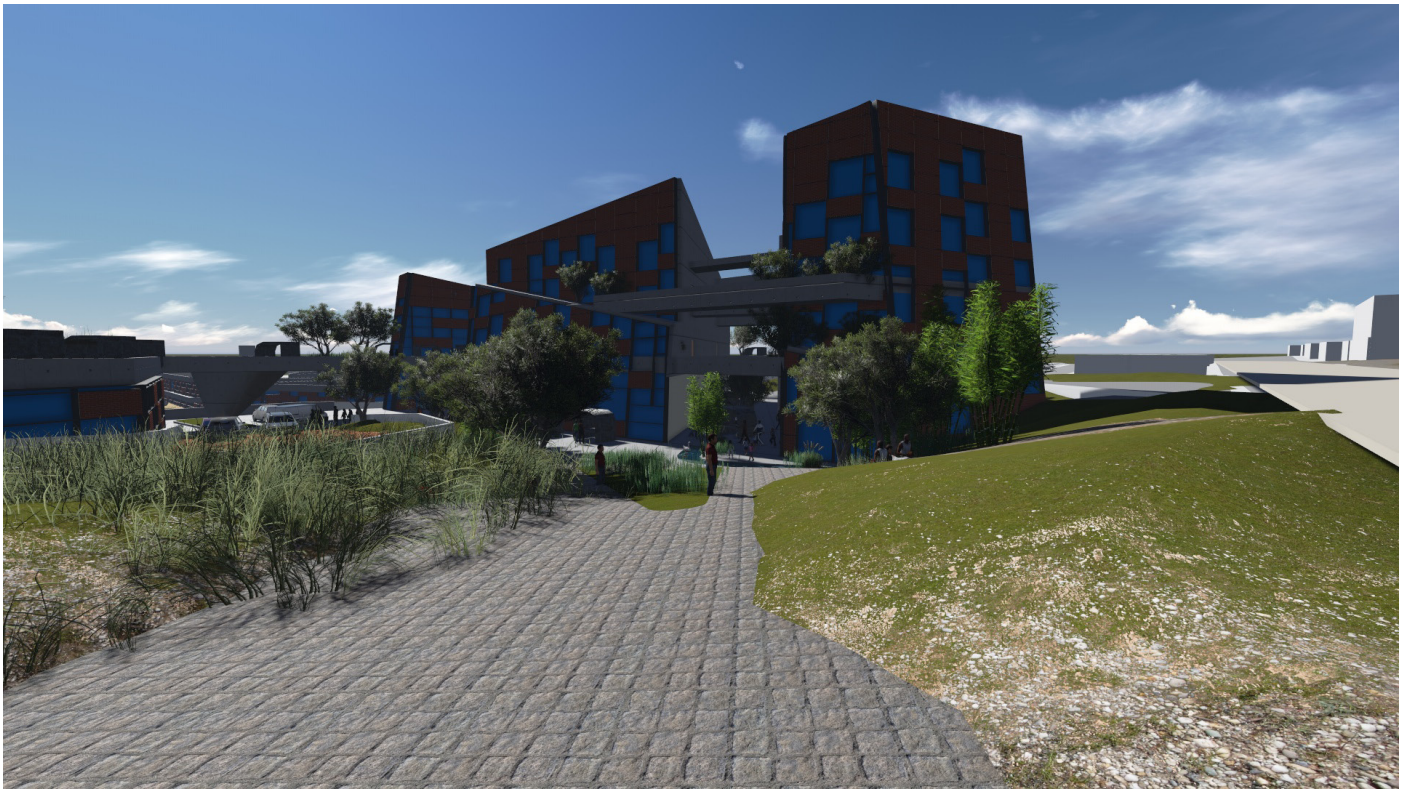


Figure 9: Initial Proposed Vibrant Economic Node
Source: Author

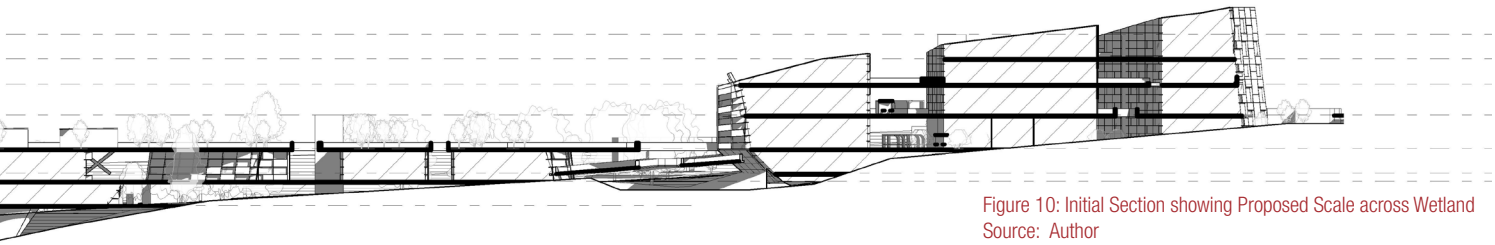


Figure 10: Initial Section showing Proposed Scale across Wetland
Source: Author

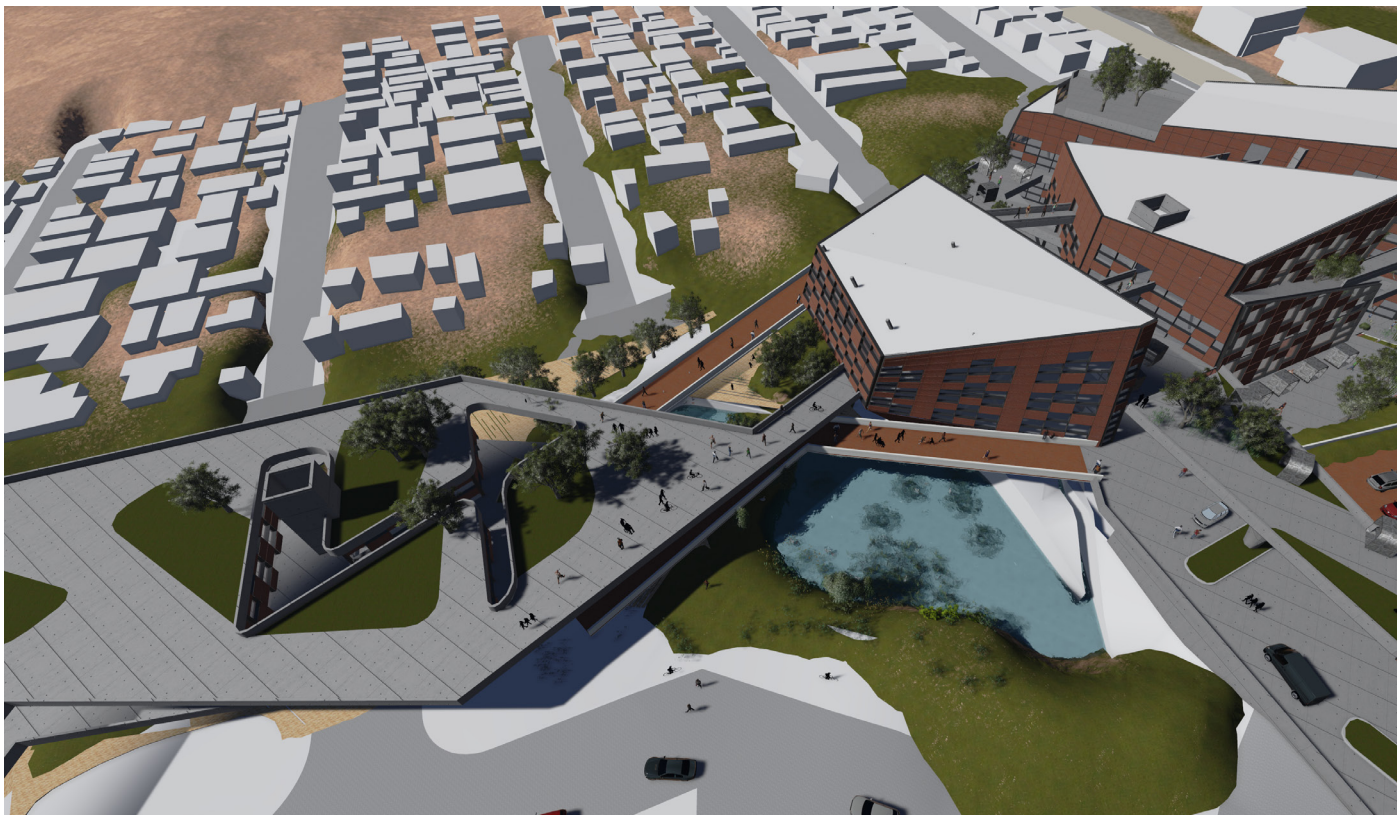
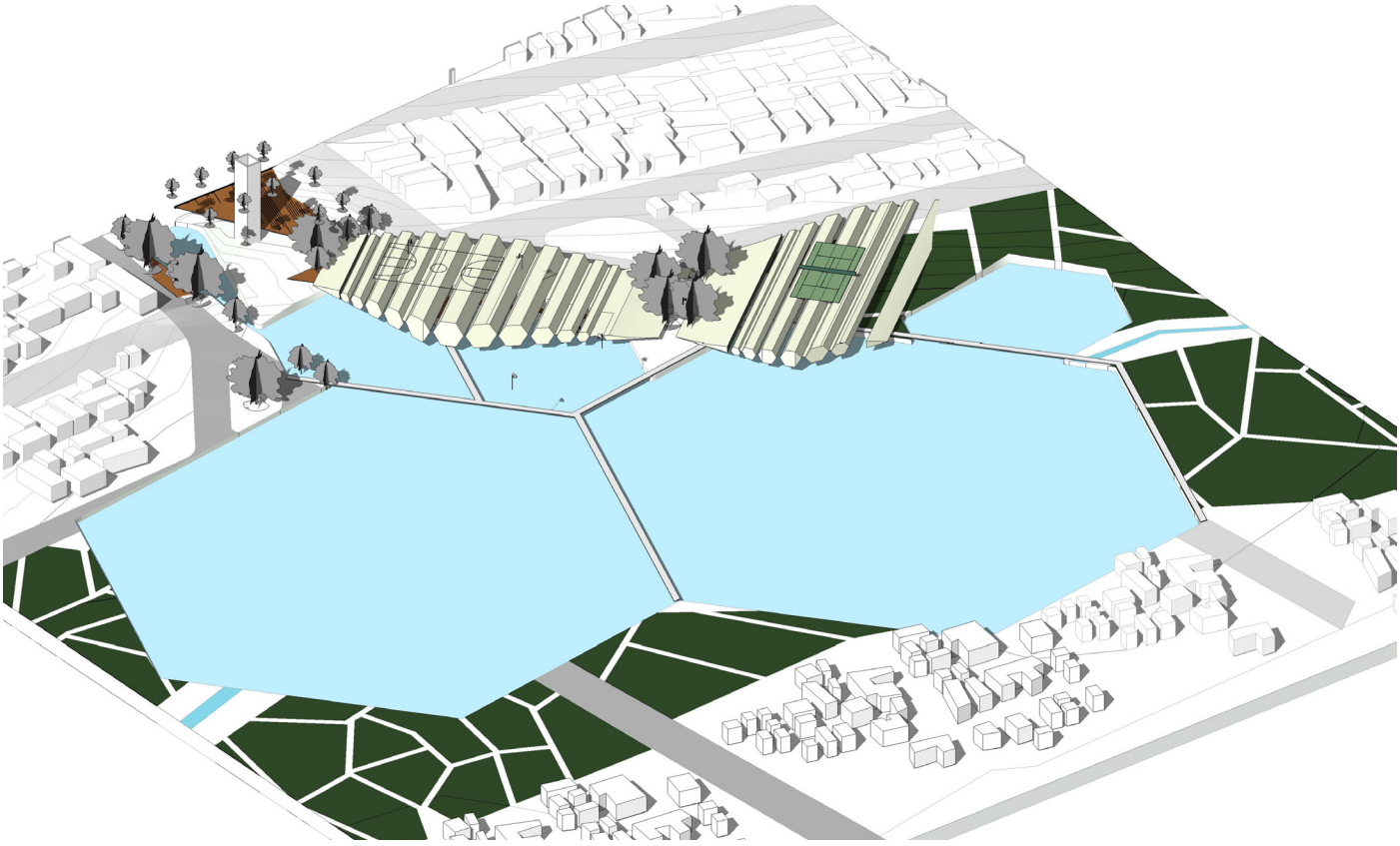


Figure 11: Initial Render of Proposal
Source: Author

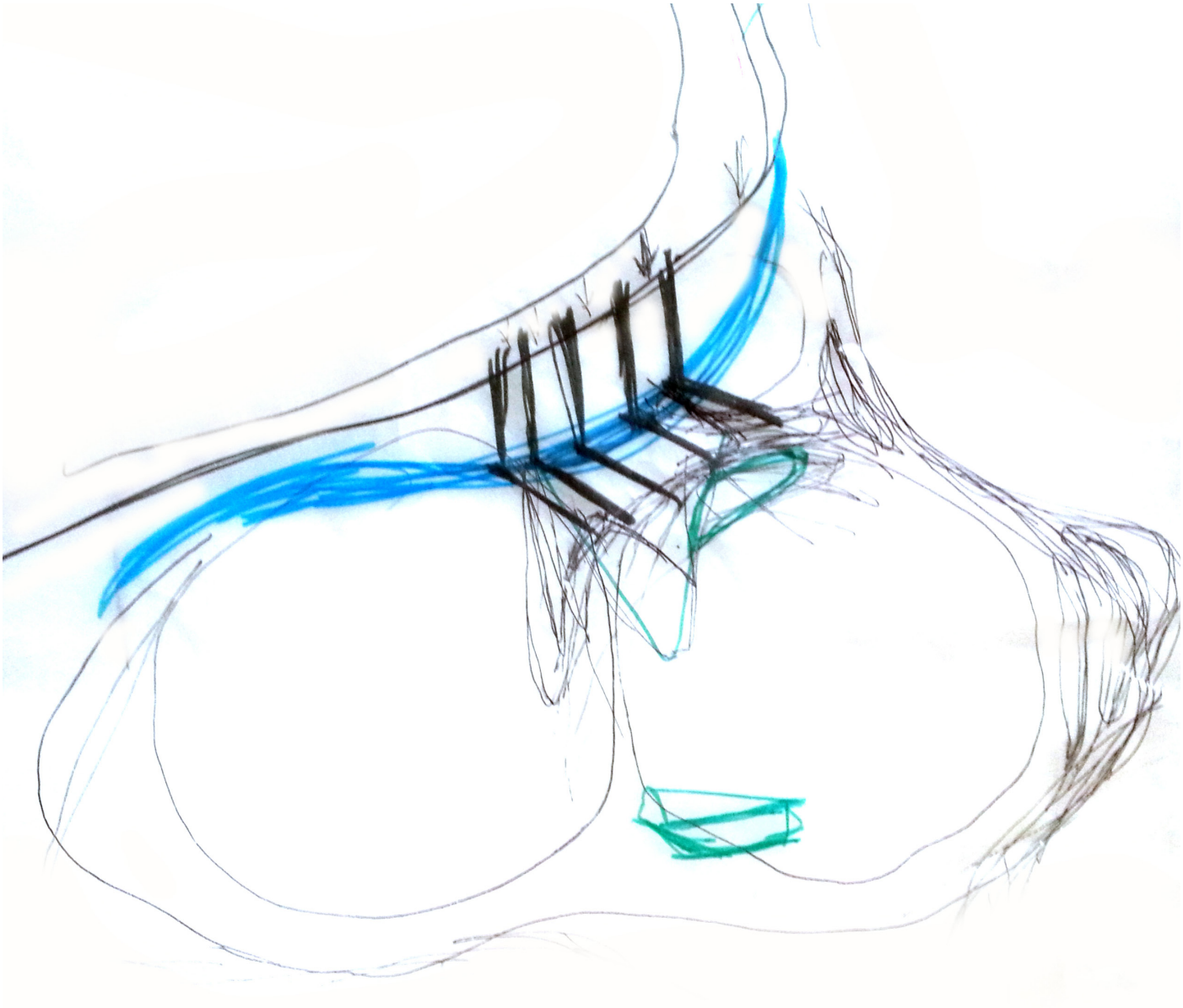


Sketch 5: Built form fragmented and cantileverd over water
Source: Author

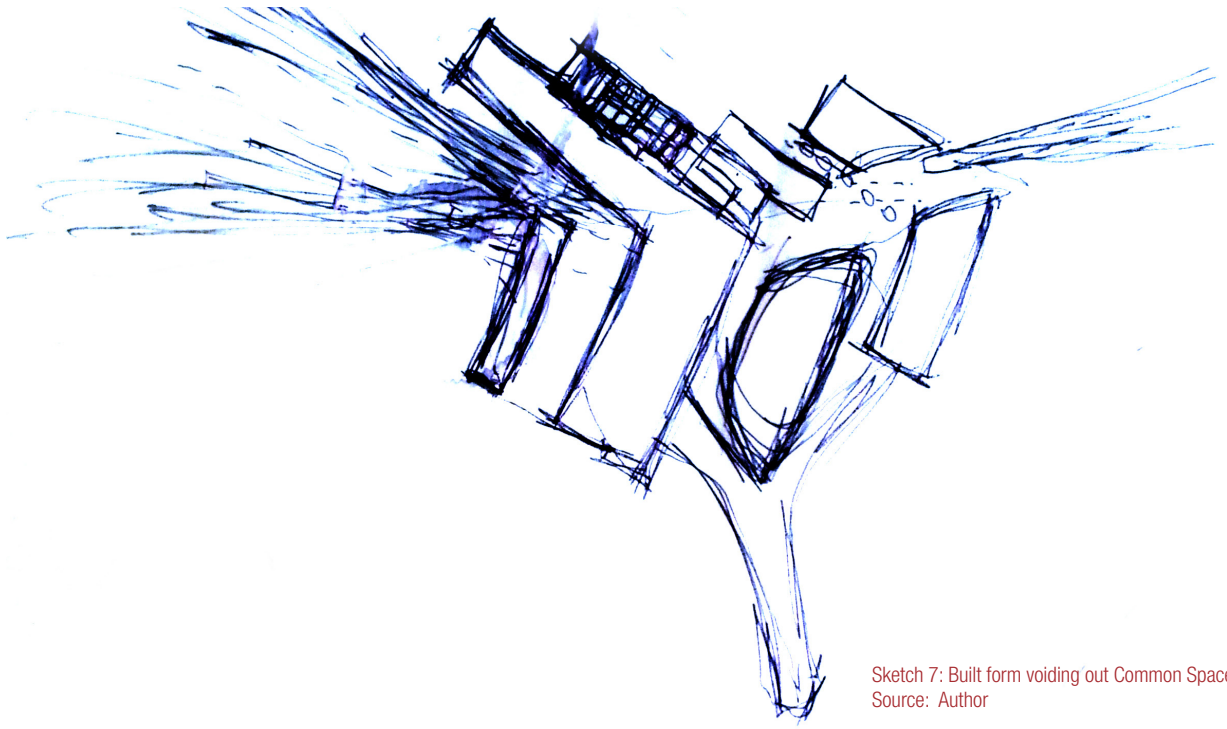
The reservoirs as discussed earlier in this document, are located in the valley which immediately suggested that this anchor would be zoned in this area as illustrated in sketch 5 - 7. It needed to anchor itself firmly on solid ground, and cantilever over the wetland touching lightly and reducing environmental impact. It needed to draw the dominant pedestrian traffic in and yet gesture over the water allowing users to enjoy their experience in Diepsloot, a refuge from their day to day hustles at the same time forming passive marketing for both the macro and micro retailer.

A strong link between the facility and the organic farm was also needed in order to reinstate the significance of the farming exercise and to functionally ease the transportation of produce to the market.

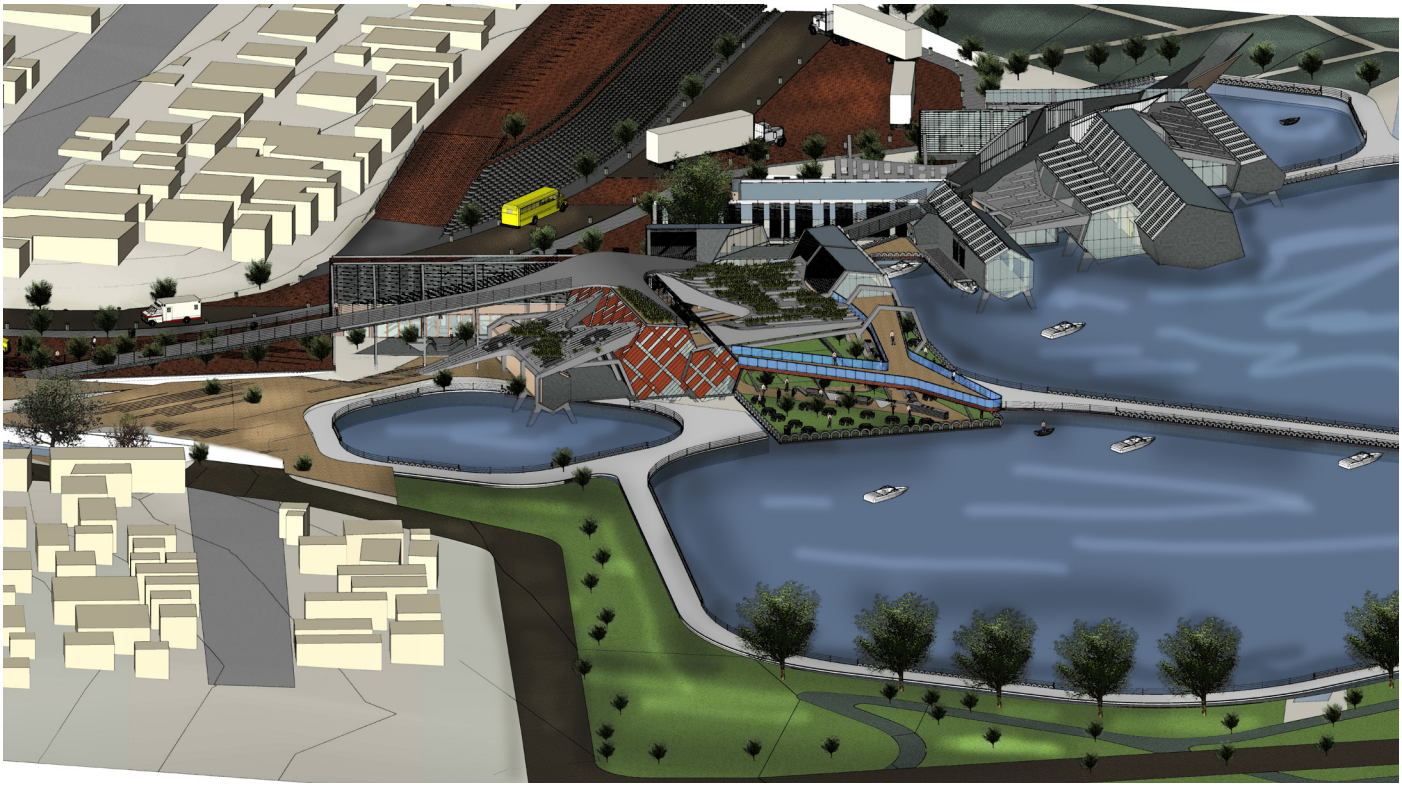
The building had to identify itself as being inspired by the main idea of fish farming and had to take on a fish section which initially manifested itself as a hexagon section, truthfully accountable to limited software capabilities.



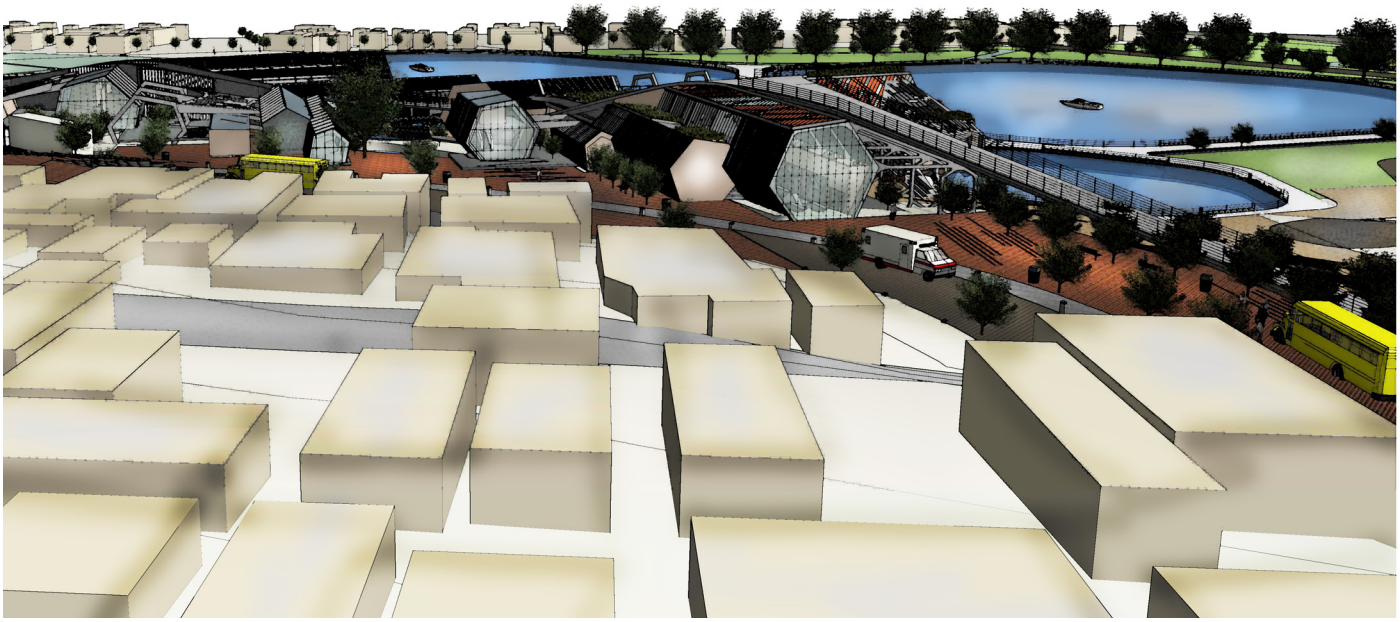
Sketch 6: Built form angling to welcome pedestrians and exploit views over water with central connecting Pedestrian Stream
Source: Author



Sketch 7: Built form voiding out Common Spaces
Source: Author

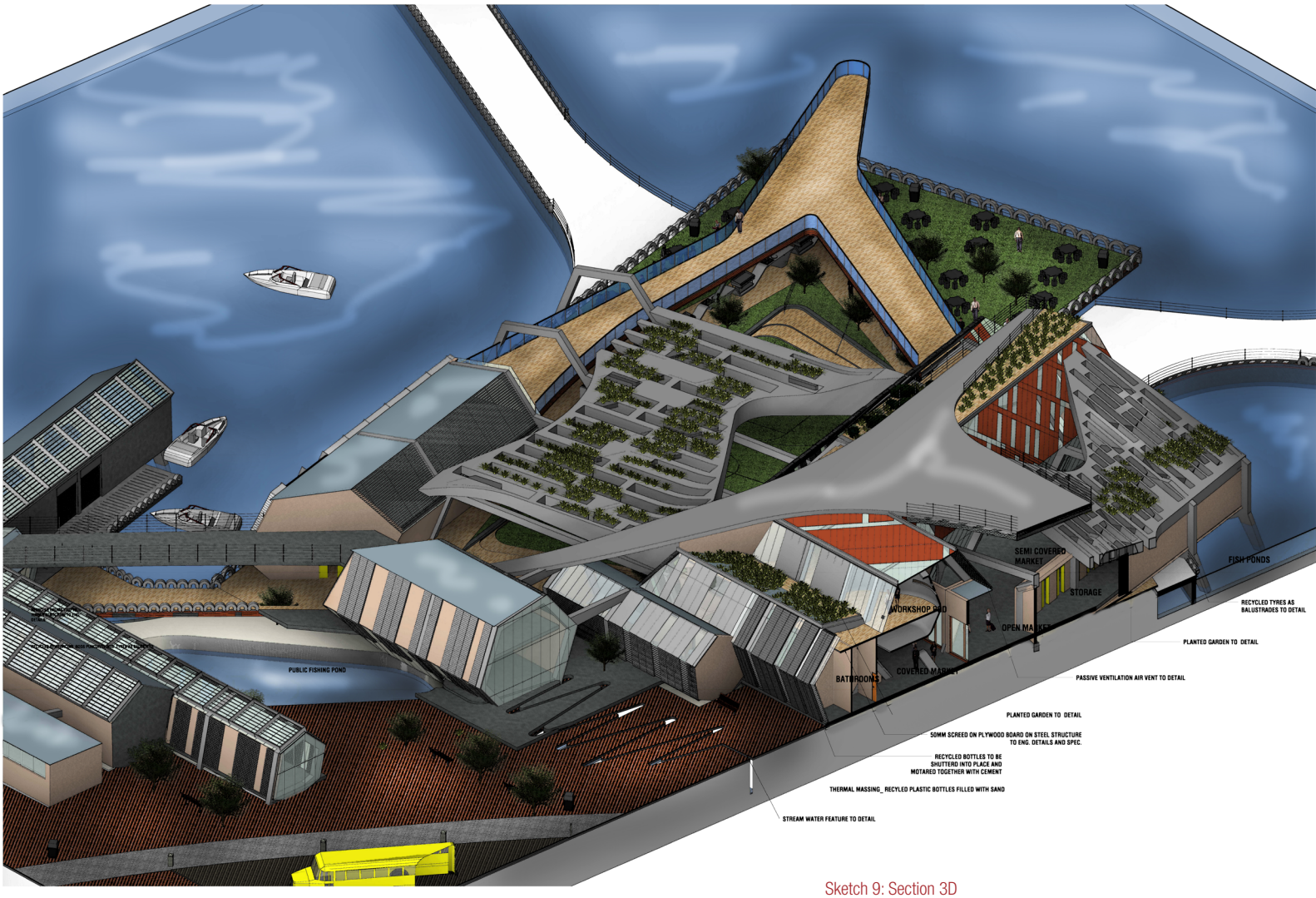


Sketch 8: Market and Farm 3D
Source: Author

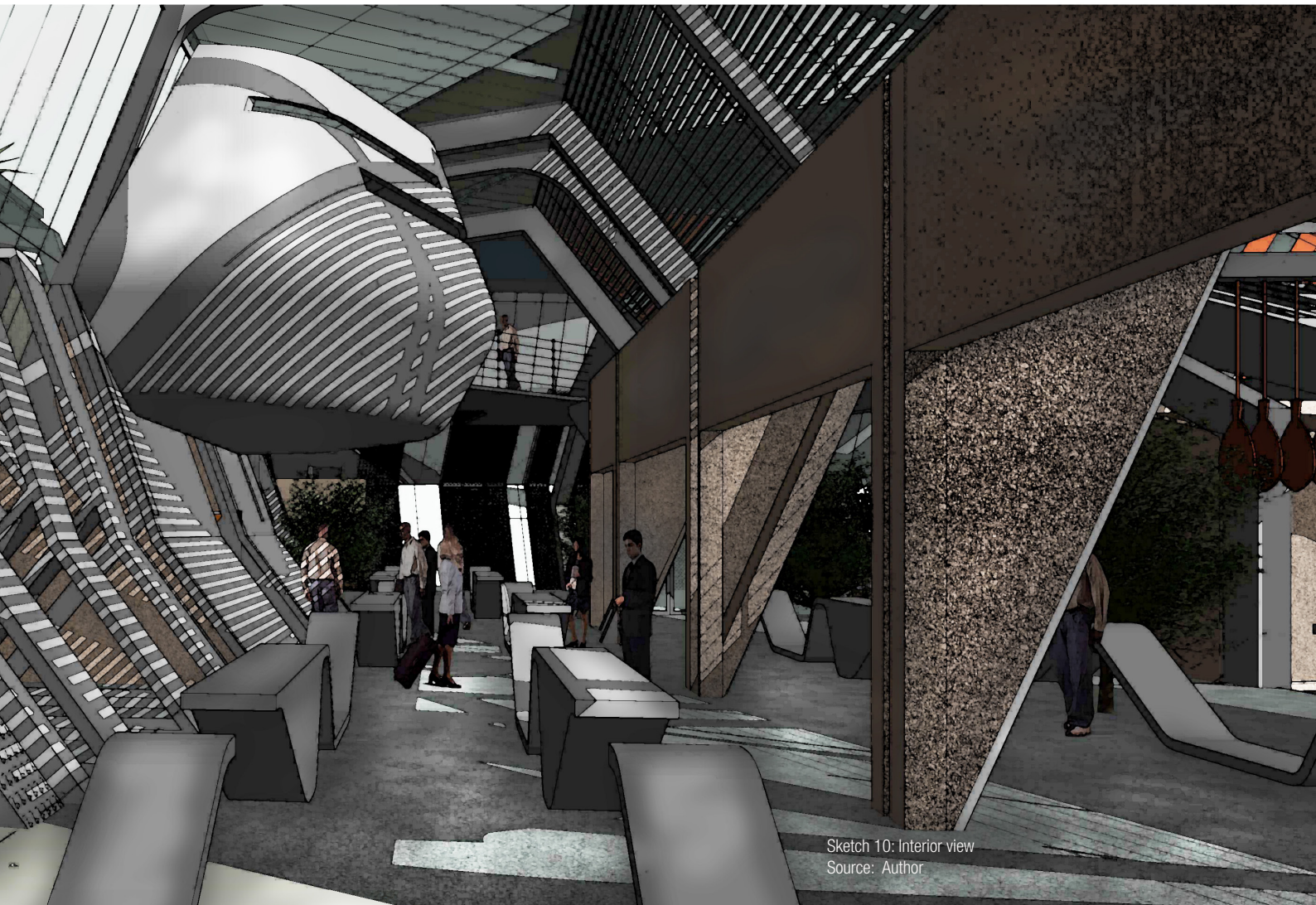


Sketch 9: Approach 3D
Source: Author

The hexagon shape illustrated in sketches 8-10, had clearly deviated from the vision of a fish section manifesting itself in built form and frankly presented an extra facade that would push the building cost up unnecessarily.
The ramp that went over the building proved purely aesthetic and therefore redundant as there was no set program for the roof other that viewing which would be compensated for by the roof over the market area.

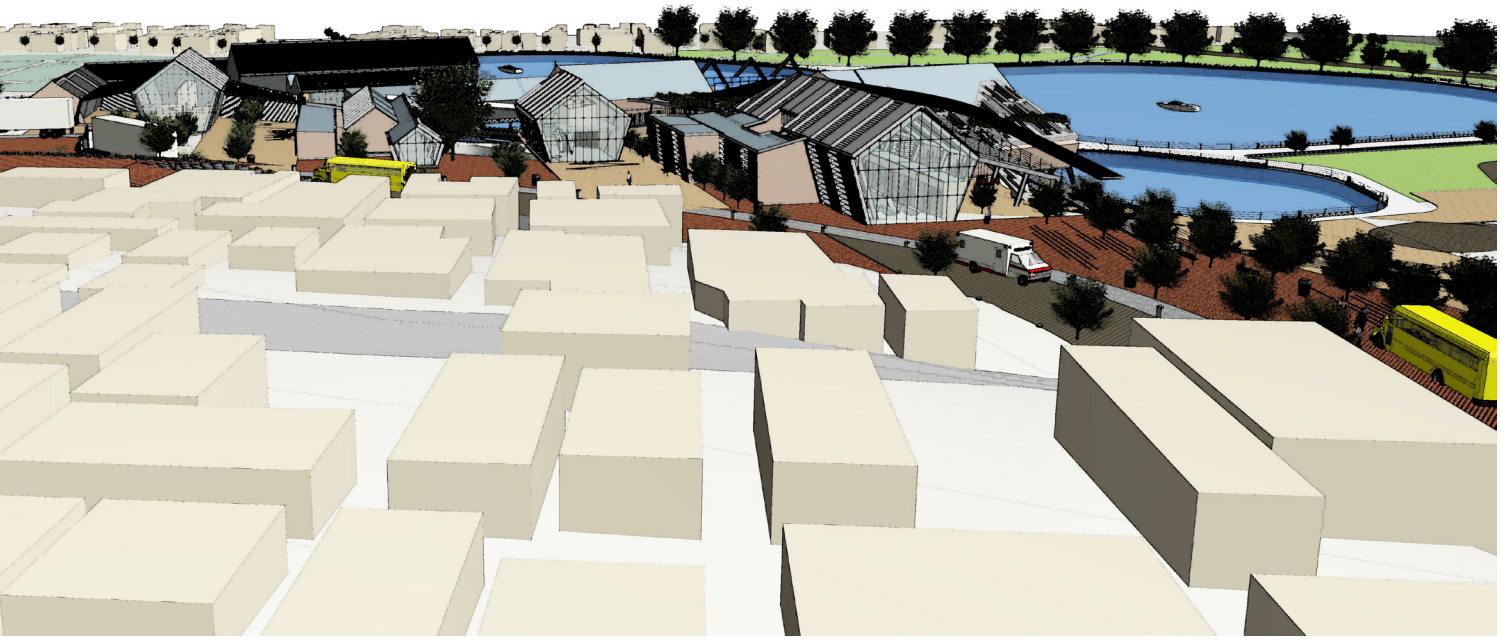


Sketch 9: Section 3D
Source: Author

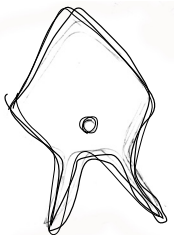


Sketch 10: Interior view
Source: Author

Sketch 11: Market and Farm 3D
Source: Author

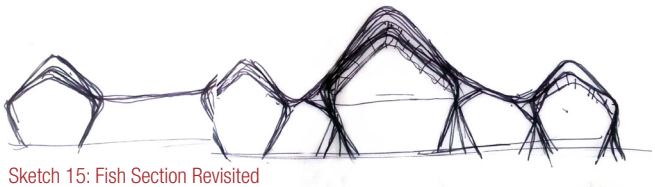


Sketch 12: Approach 3D
Source: Author

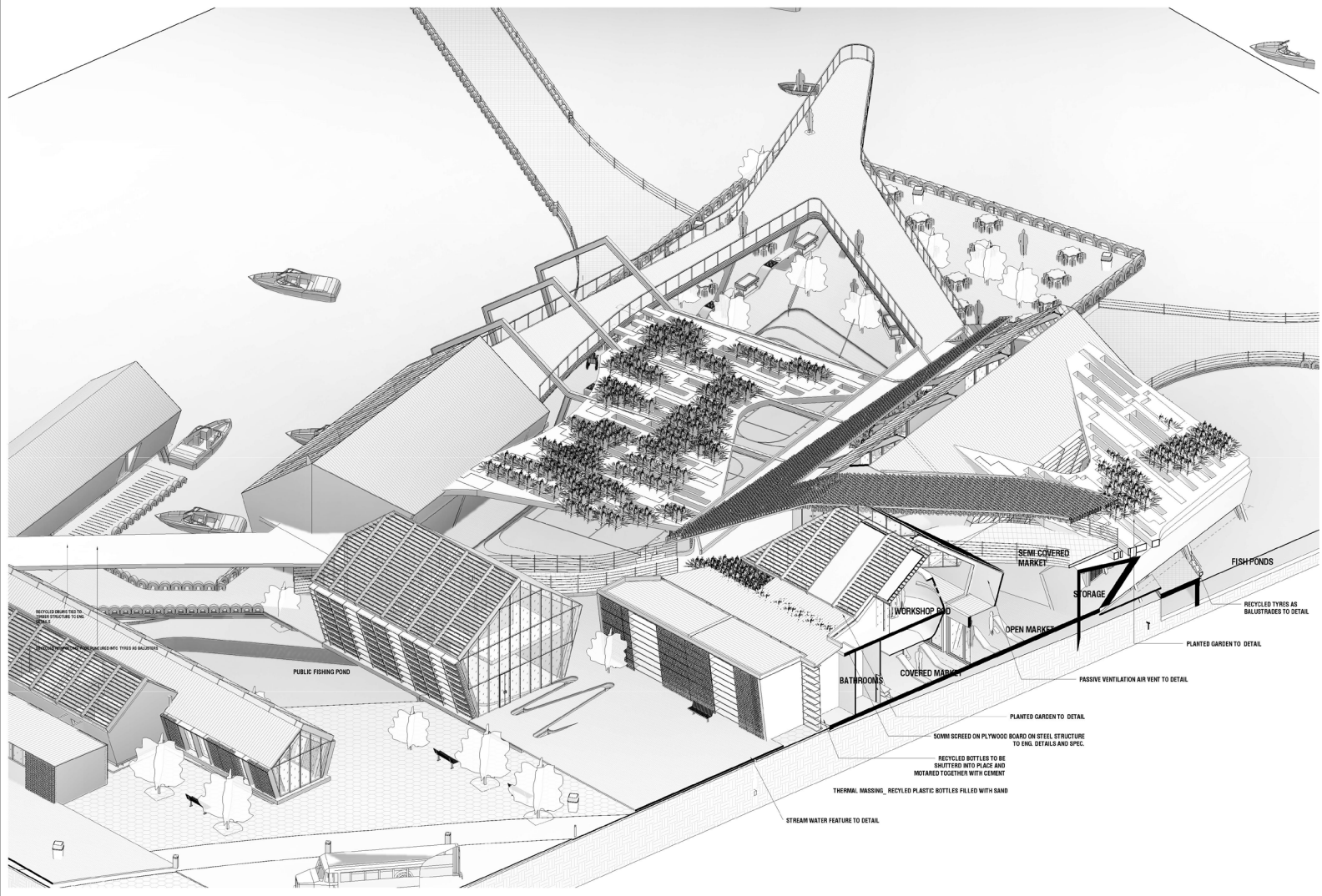


The design then evolved from the hexagon section to a more functional Pentagon section as illustrated in sketches 12 -15.

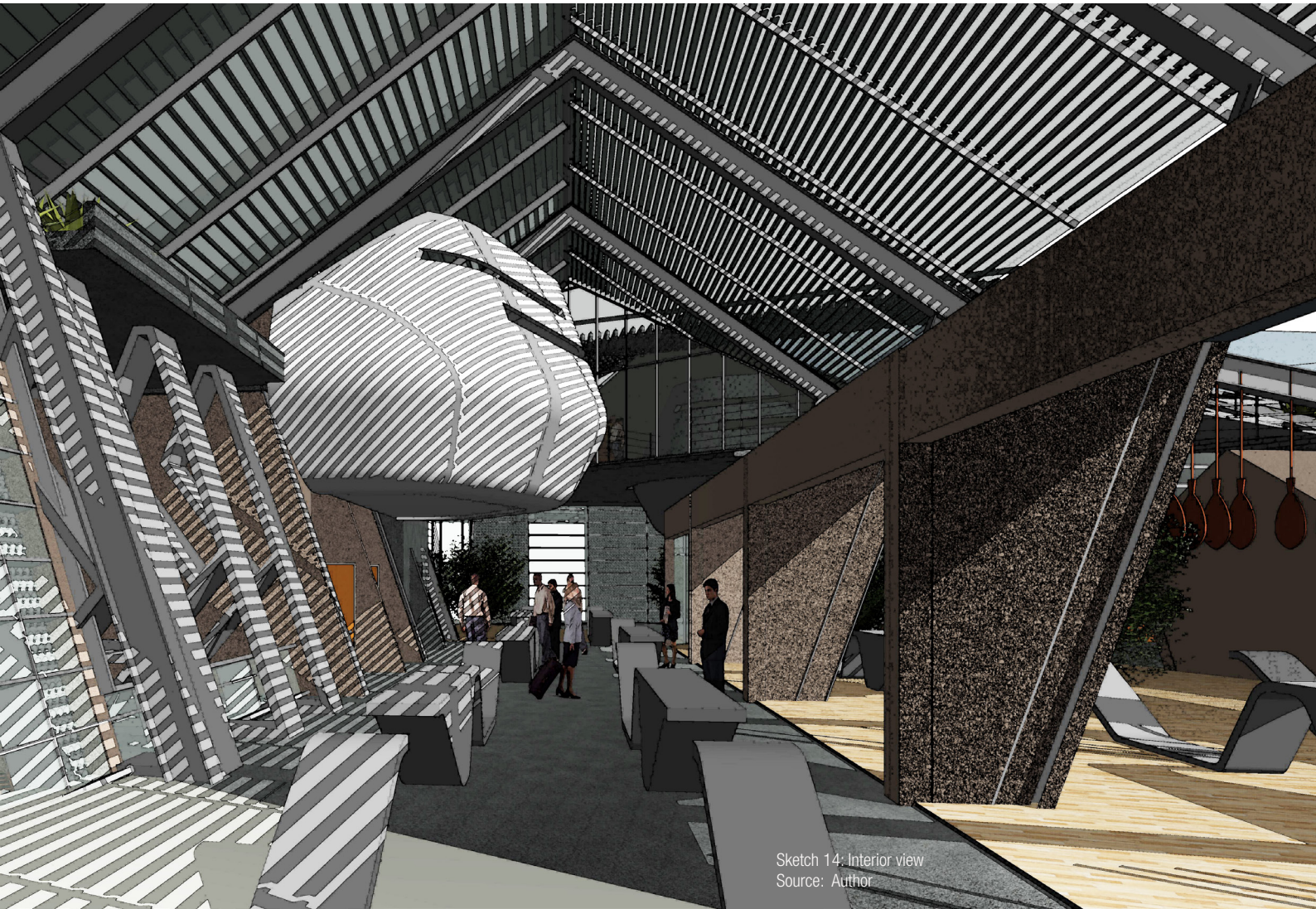
The ramp dropped to a more functional level and the framing element became a canopy over the ramp. This design seemed to lack in the fluidity and elegance that a fish section stood for. It read as being rigid and industrial in nature , which would have been perfect for the production component but in-apropriate for the more public spaces.the fish section was revisted as illustrated in sketches, and from there the concept was firmed up, and the final languange was developed .The following section brings forth the final design concept and outcome.



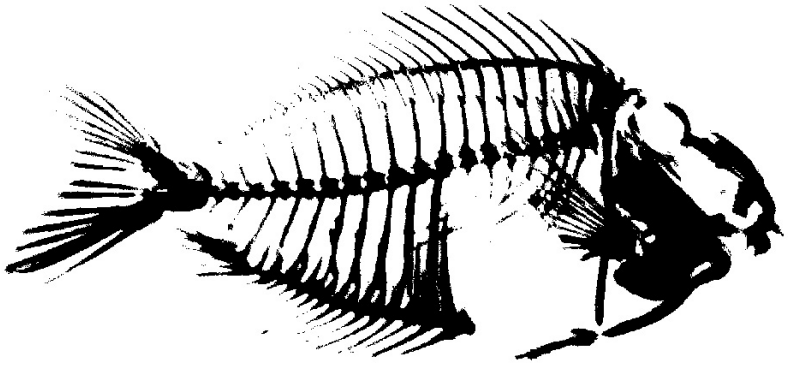
Sketch 15: Fish Section Revisited
Source: Author



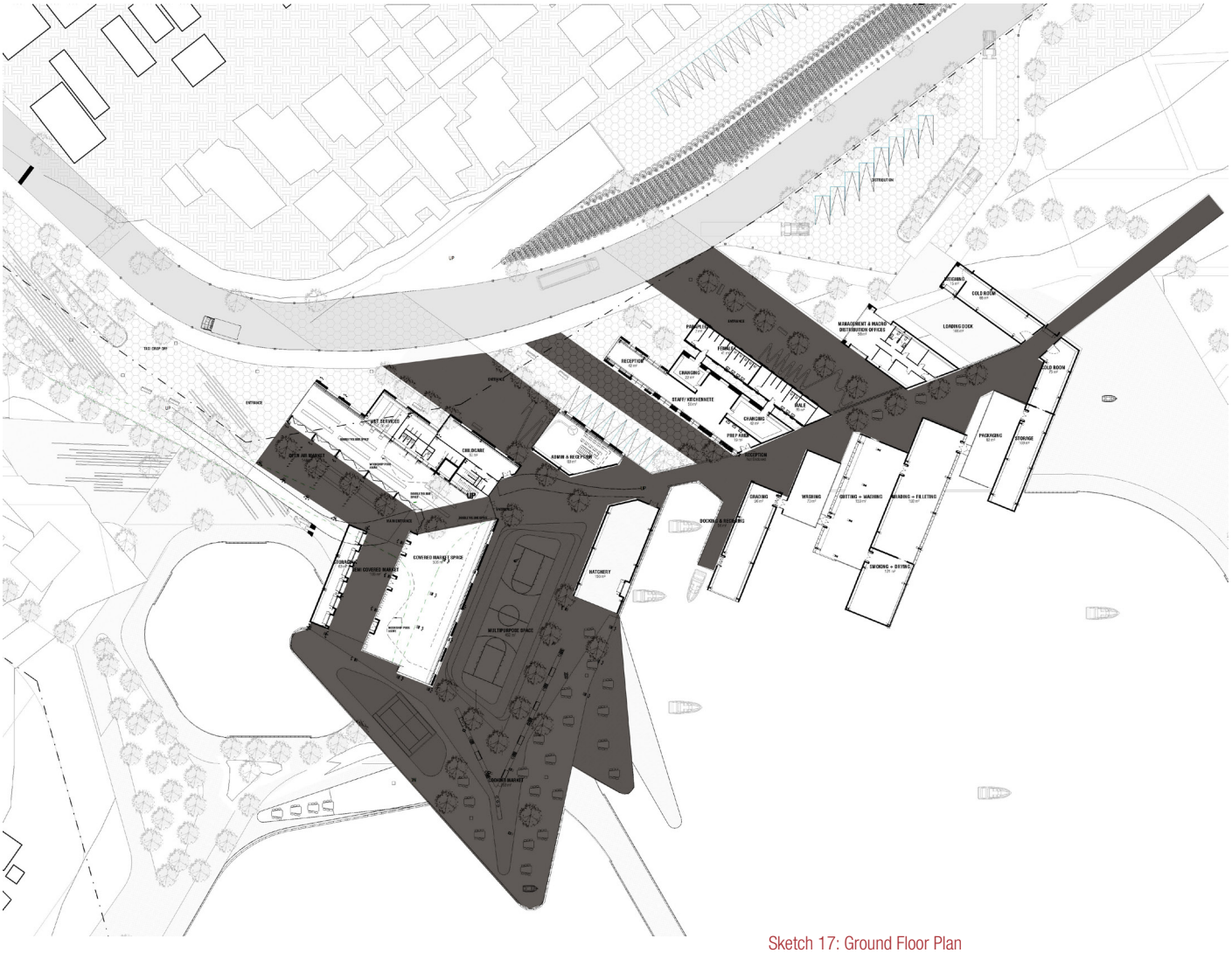
Sketch 13: Section 3D
Source: Author



Sketch 14: Interior view
Source: Author



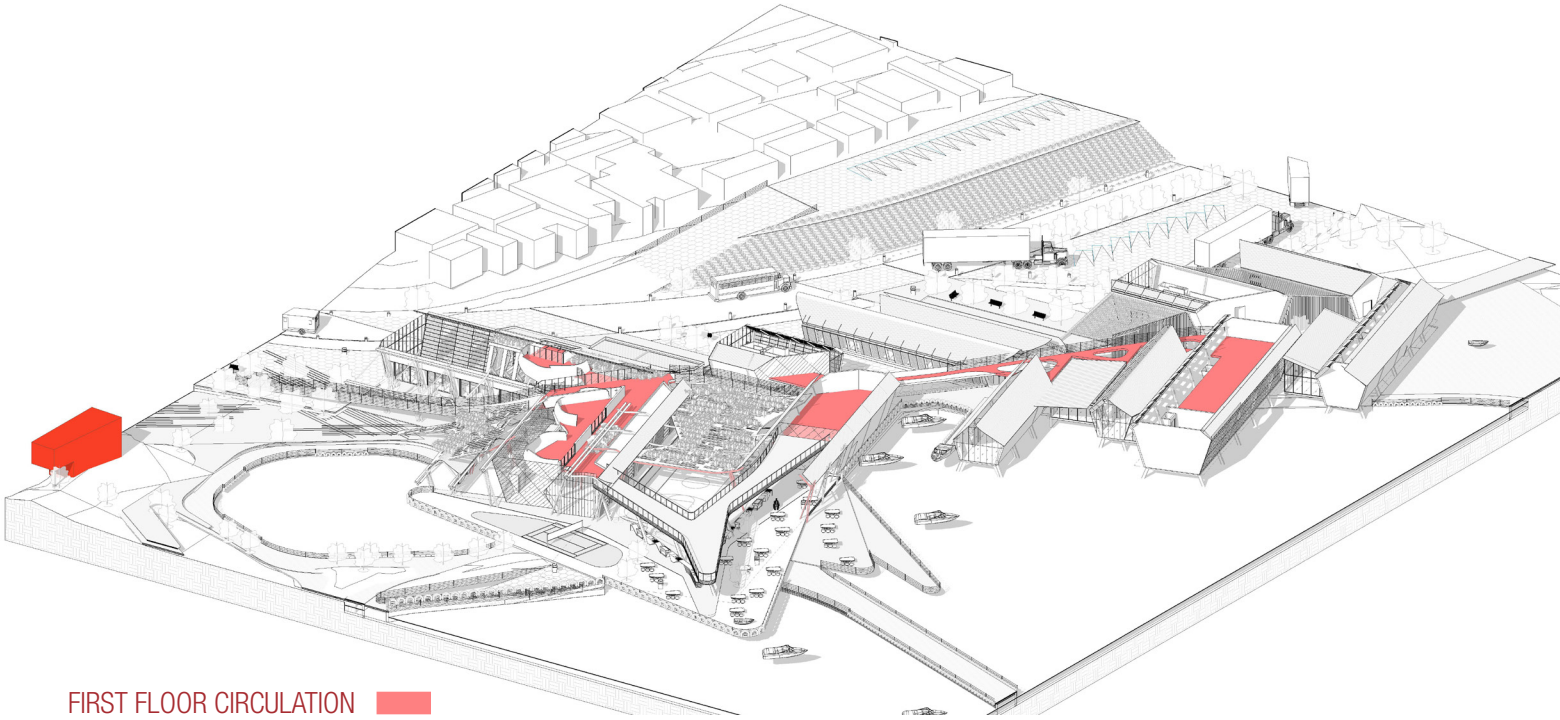
Sketch 16: Fish Section
Source: Online Unknown



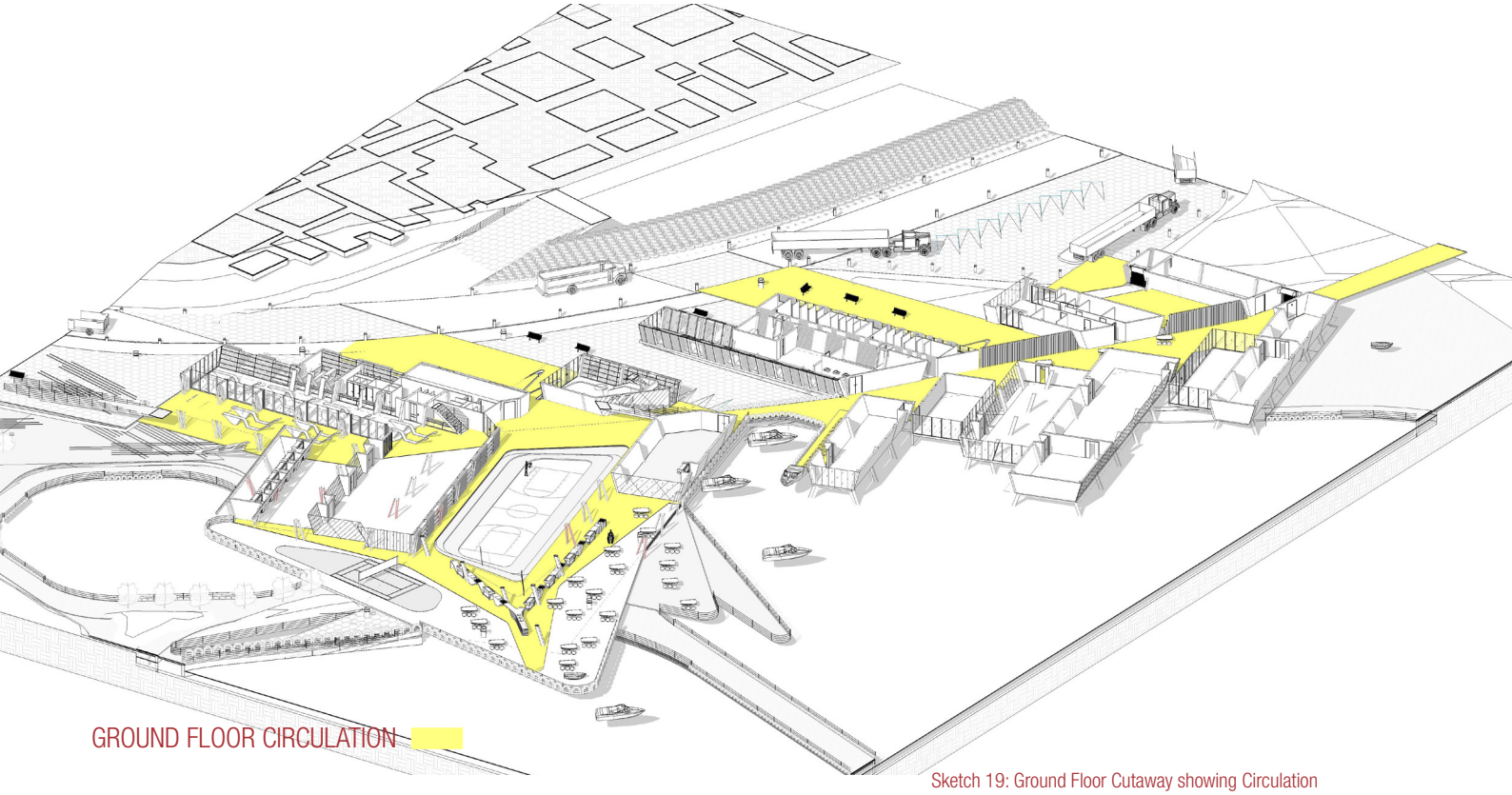
Sketch 17: Ground Floor Plan
Source: Author

Concept:

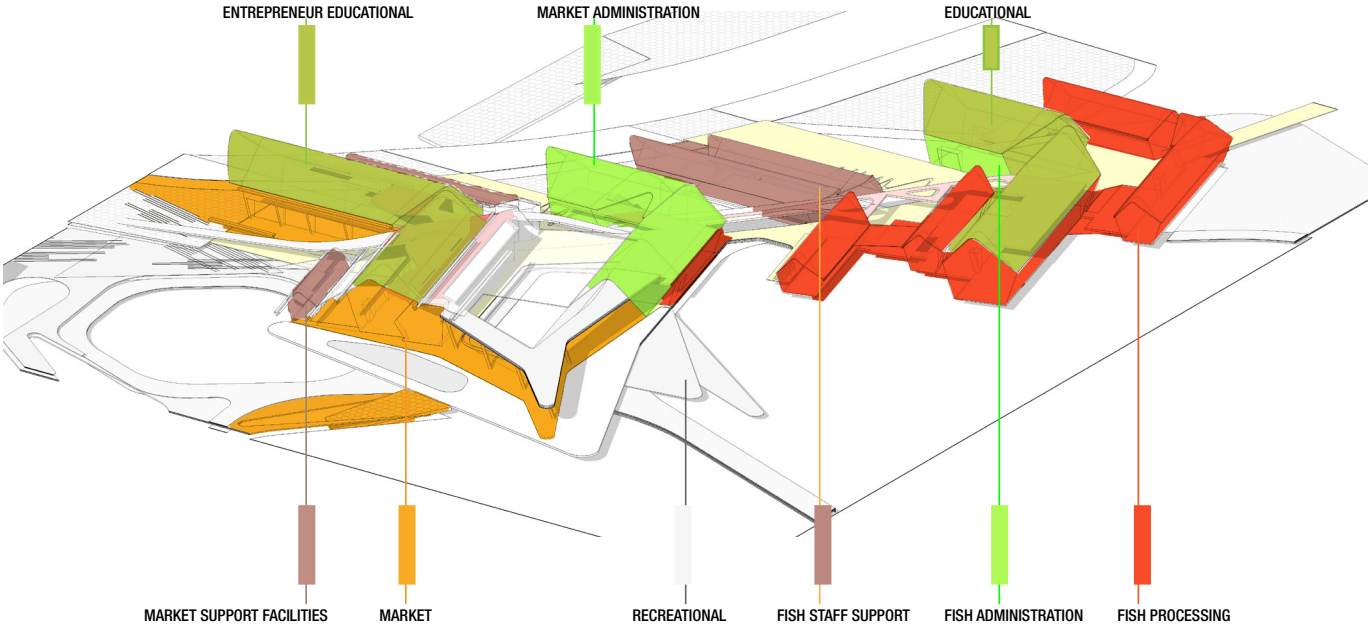
The concept is inspired by the idea of bio mimicry. The spine or the skeleton assists in the ordering of the programme, illustrated in sketches 16 -19. A head, which forms the macro retail component, with its tail being the micro retail component linked by a central spine with its supporting facilities to make an efficient whole, neither one can survive without the other or the existing supporting spine.



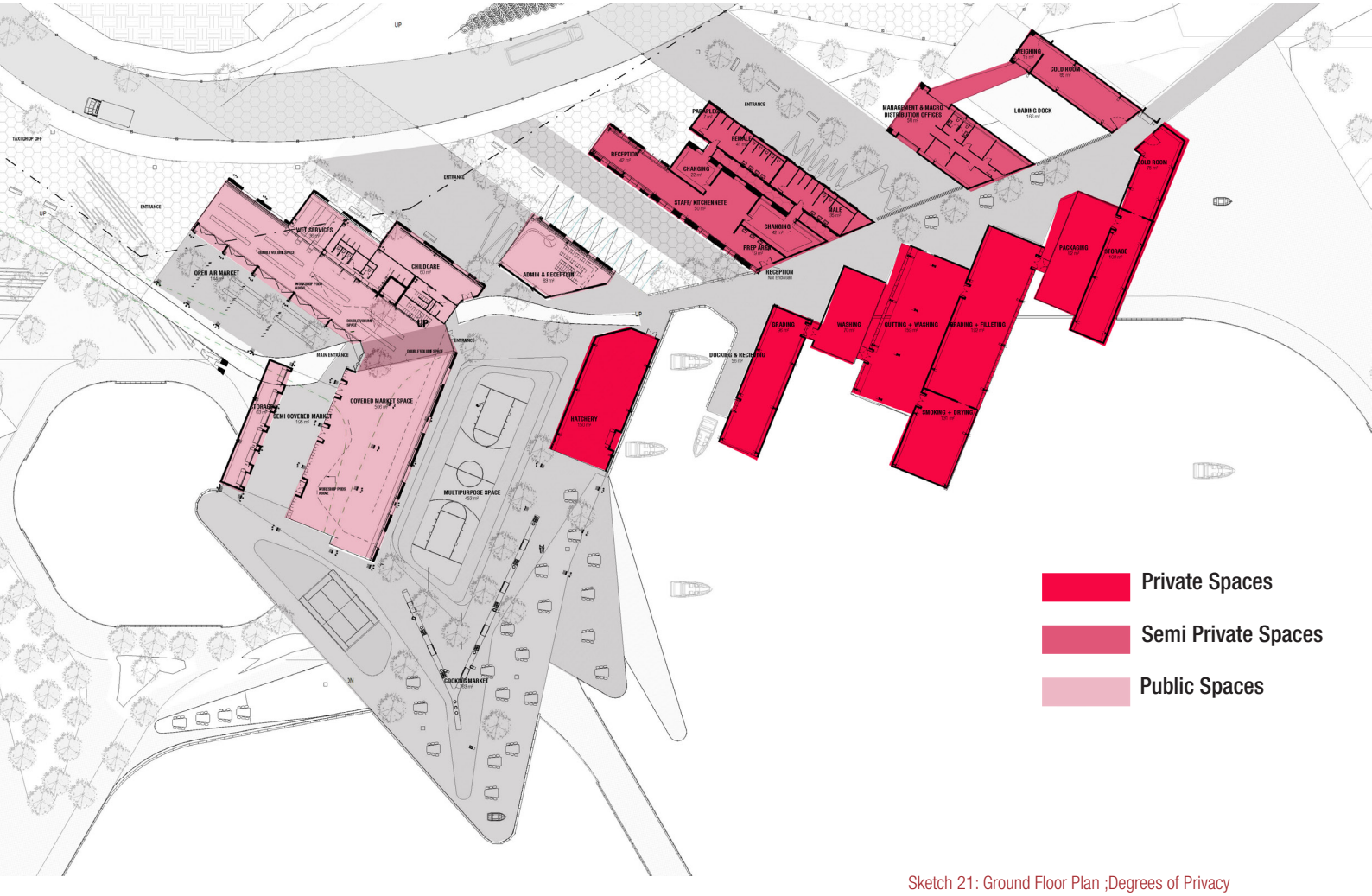
Sketch 18: First Floor Cutaway showing Circulation
Source: Author



Sketch 19: Ground Floor Cutaway showing Circulation
Source: Author



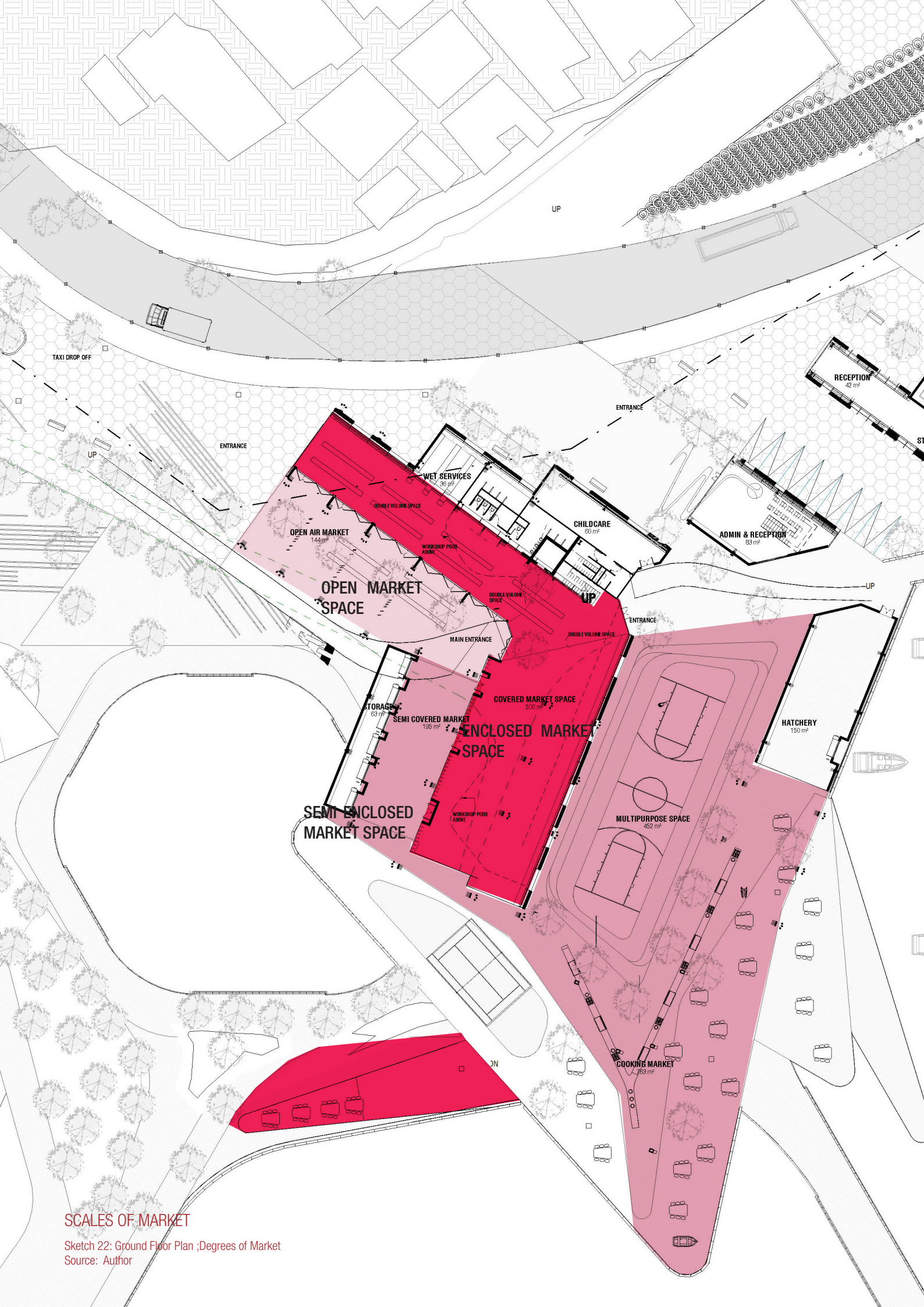
Sketch 20: Functional Zoning
Source: Author



Sketch 21: Ground Floor Plan ;Degrees of Privacy
Source: Author

A hierarchy of order in spaces is established with the tail forming the public to semi-public north of the spine to private south of the spine.

The between spaces act as connection spaces, where south of the spine forms connections with the water, for the functional purposes of docking, and other fish processes. North of the spine forms an interaction with the street, encouraging the public to flow into the development. Main access points are easily identified by the large gaps between the structures. Streams springing from the streets also act as directional markers to the entrances.



SCALES OF MARKET

Sketch 22: Ground Floor Plan ;Degrees of Market
Source: Author

RECREATIONAL SPACES

Sketch 23: Ground Floor Plan ;Recreational Spaces
Source: Author

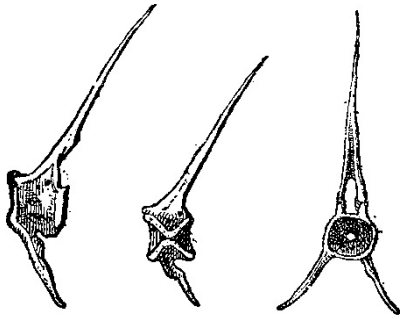
- Mixed Use Space; Market/Recreational
- Fishing Deck
- Sand Pitt
- Aquarium Restruant

RECREATIONAL & GREEN SPACES

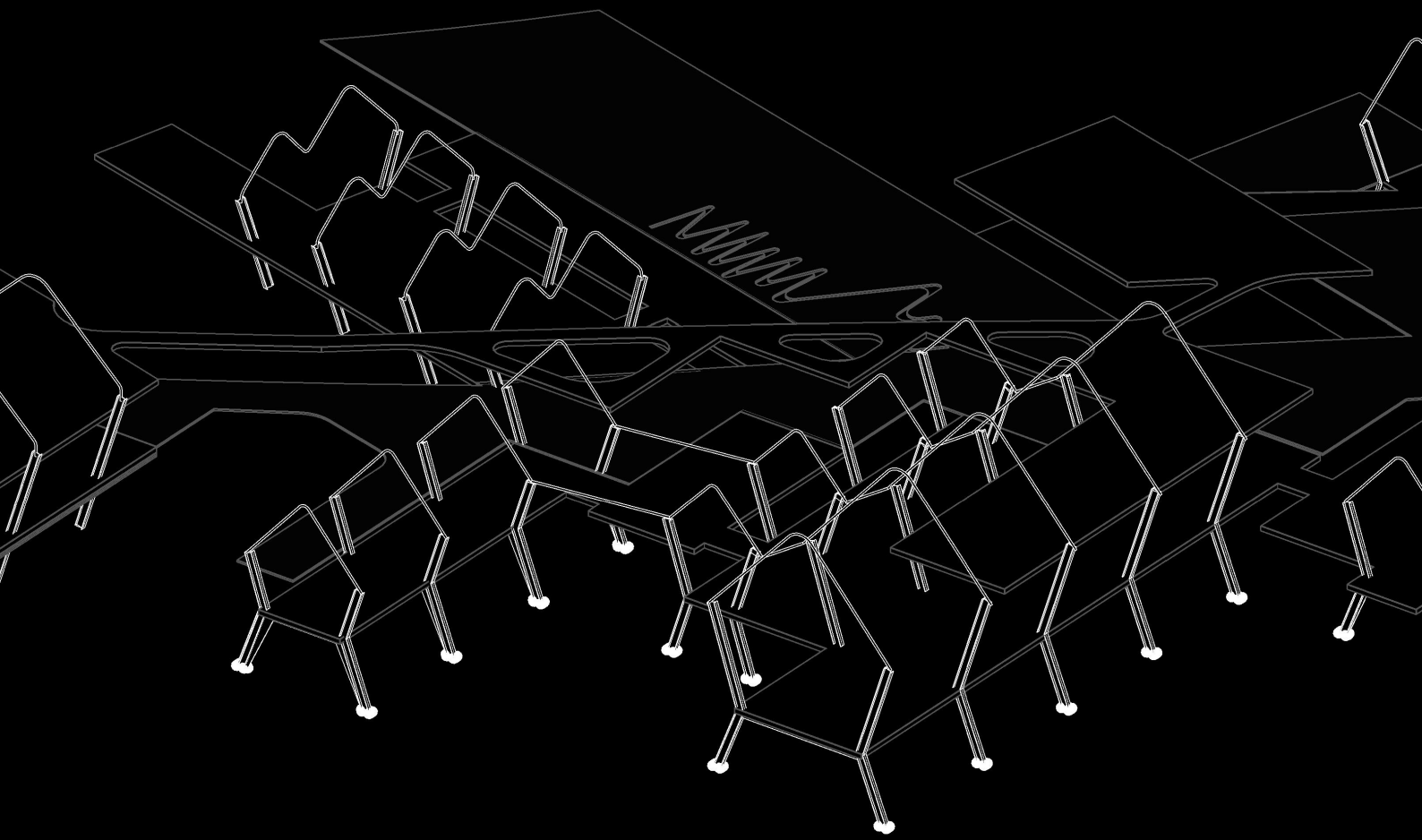
Sketch 24: Site Plan
Source: Author

The Structure

Derived from a combination of fish bone sections illustrated in sketch 26, the resulting geometries create spaces from which produce can be hung, solar panels can be placed without the aid of additional structure, skylights can be placed with simple waterproofing detailing and additional produce, such as herbs can be grown next to the market. The structure allows the spaces to cantilever of the water bodies, giving the look and feel as though also floating. A more elegant hot rolled tubular sections support the roof structure in the public spaces , with more industrial l

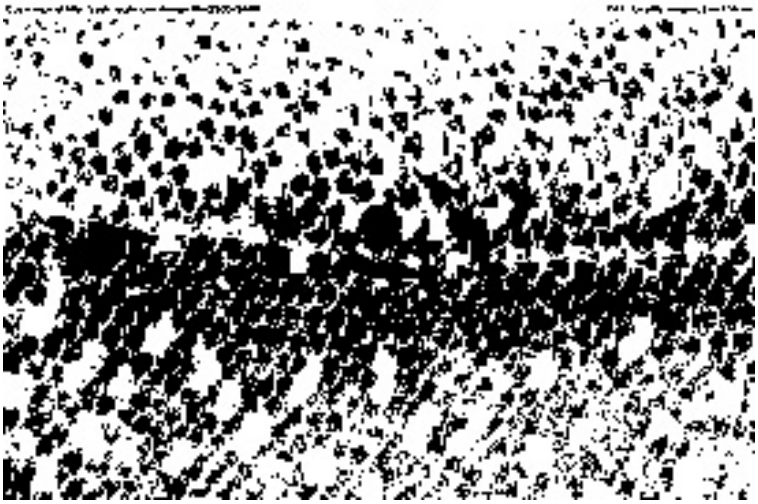


Sketch 26: Fish Structural Skelaton
Source: Online unknown

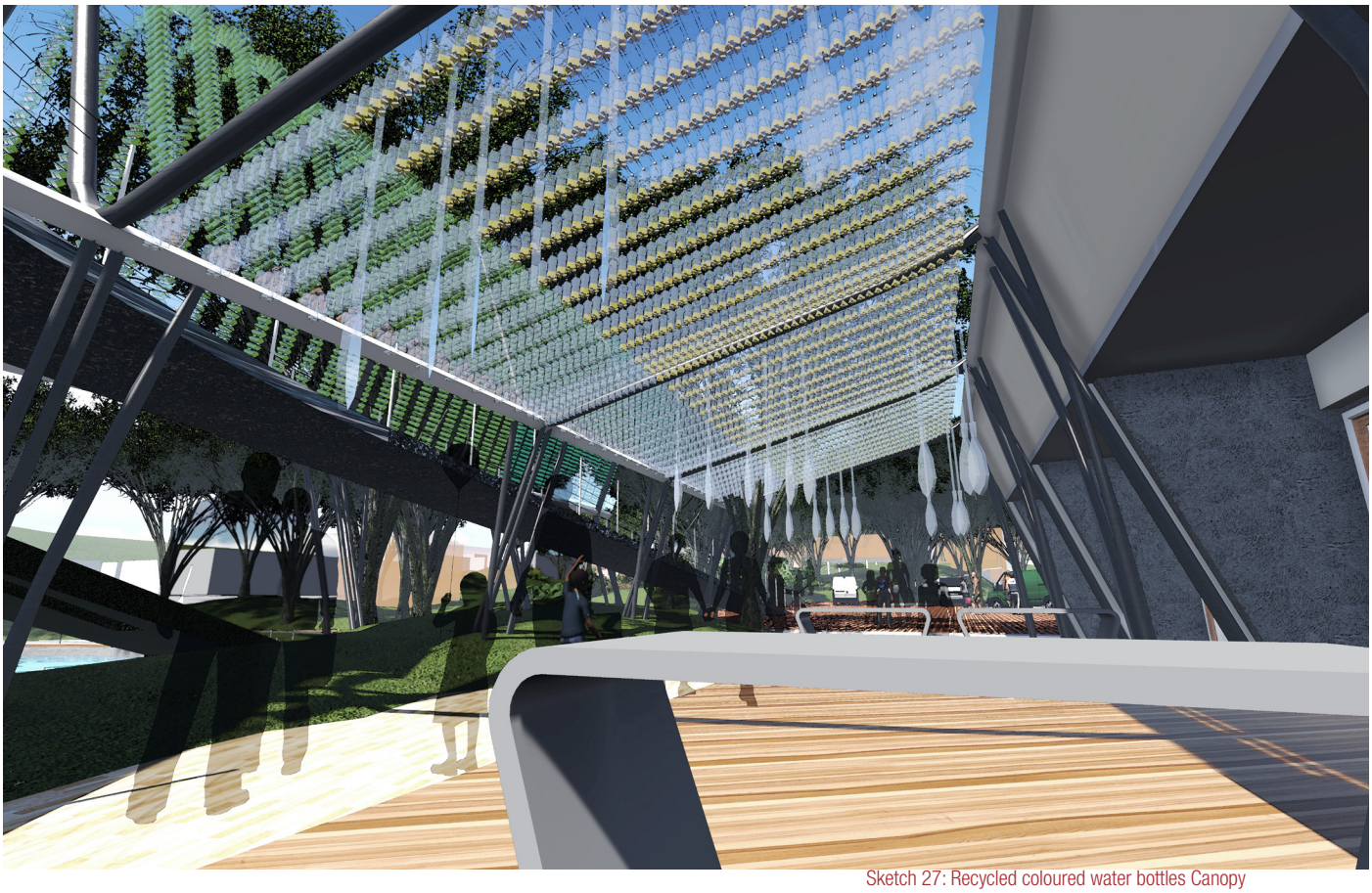


Sketch 25: Structural Skelaton
Source: Author

section supporting the roof structure for the production spaces as illustrated in sketch 25.



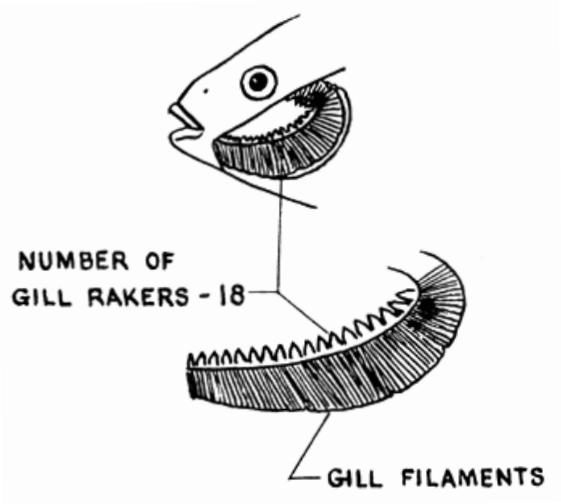
Sketch 26: Fish Scales
Source: Online Unknown



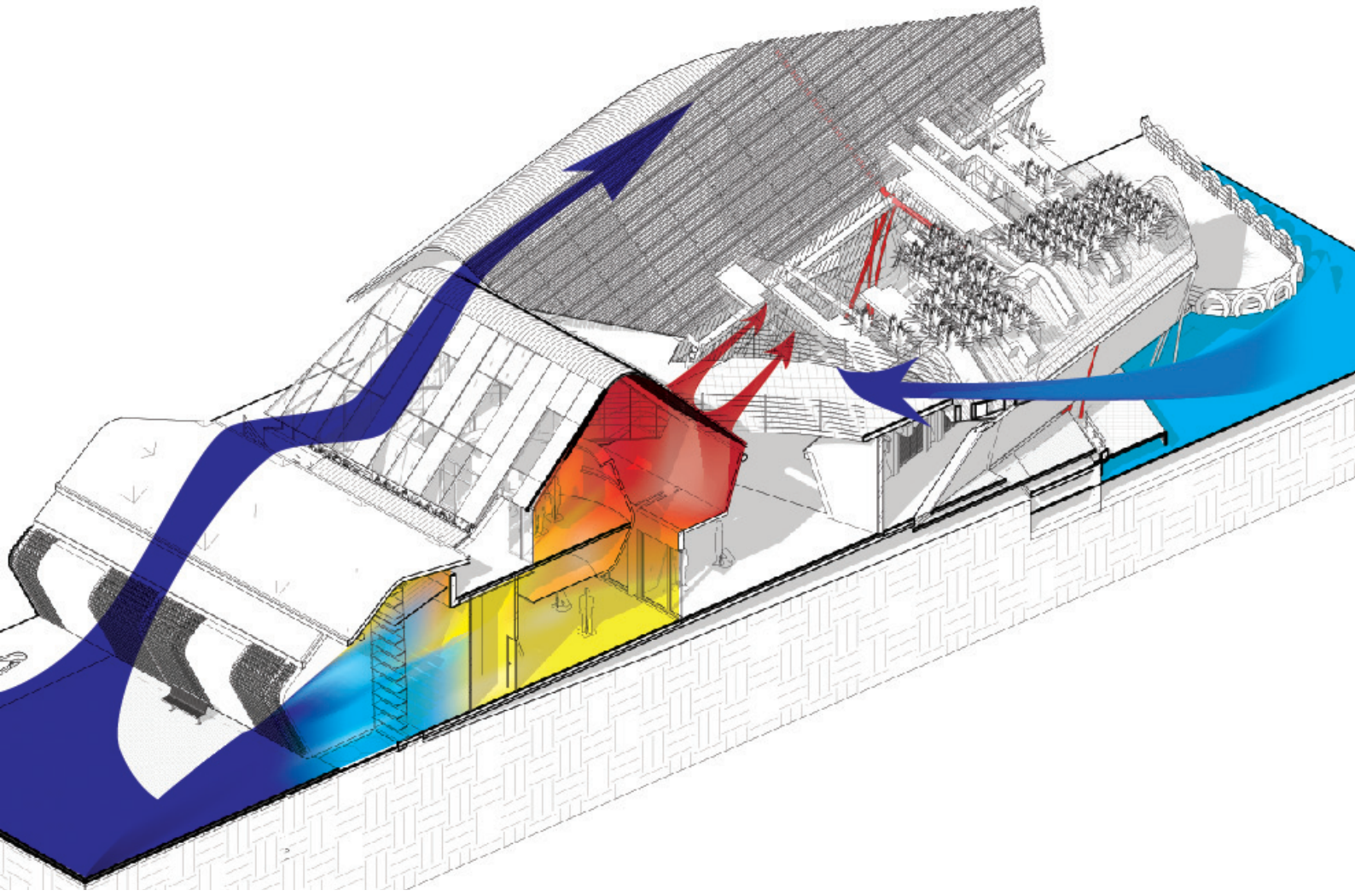
Sketch 27: Recycled coloured water bottles Canopy
Source: Author

The skin takes on the textured nature of fish scales culminating it as:

1. Façade finish
2. Tool used to reduce glazed surface area



Sketch 28: Fish Gills
Source: Online Unknown



Sketch 29: Ventilation;gill biomimicry
Source: Author

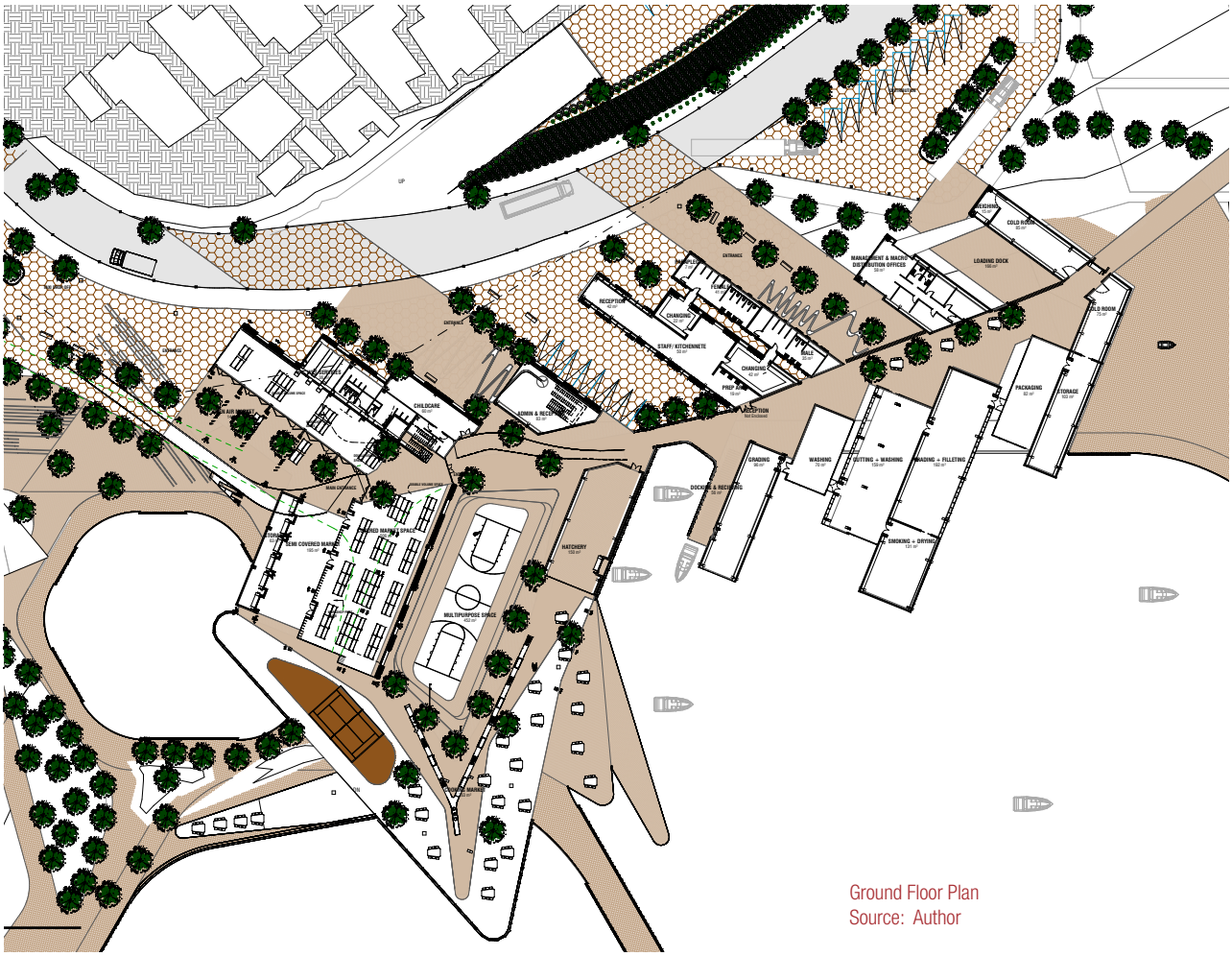
The gills

Similar to the way fish gills are positioned and have several filaments ,position of the openings is designed to maximise the capture of prevailing winds, particularly in summer, naturally ventilating the spaces. The numerous fingers, such as the gill filaments, in both plan and section ,allow increased surface area for fresh air absorption, allowing for cool, well ventilated spaces.

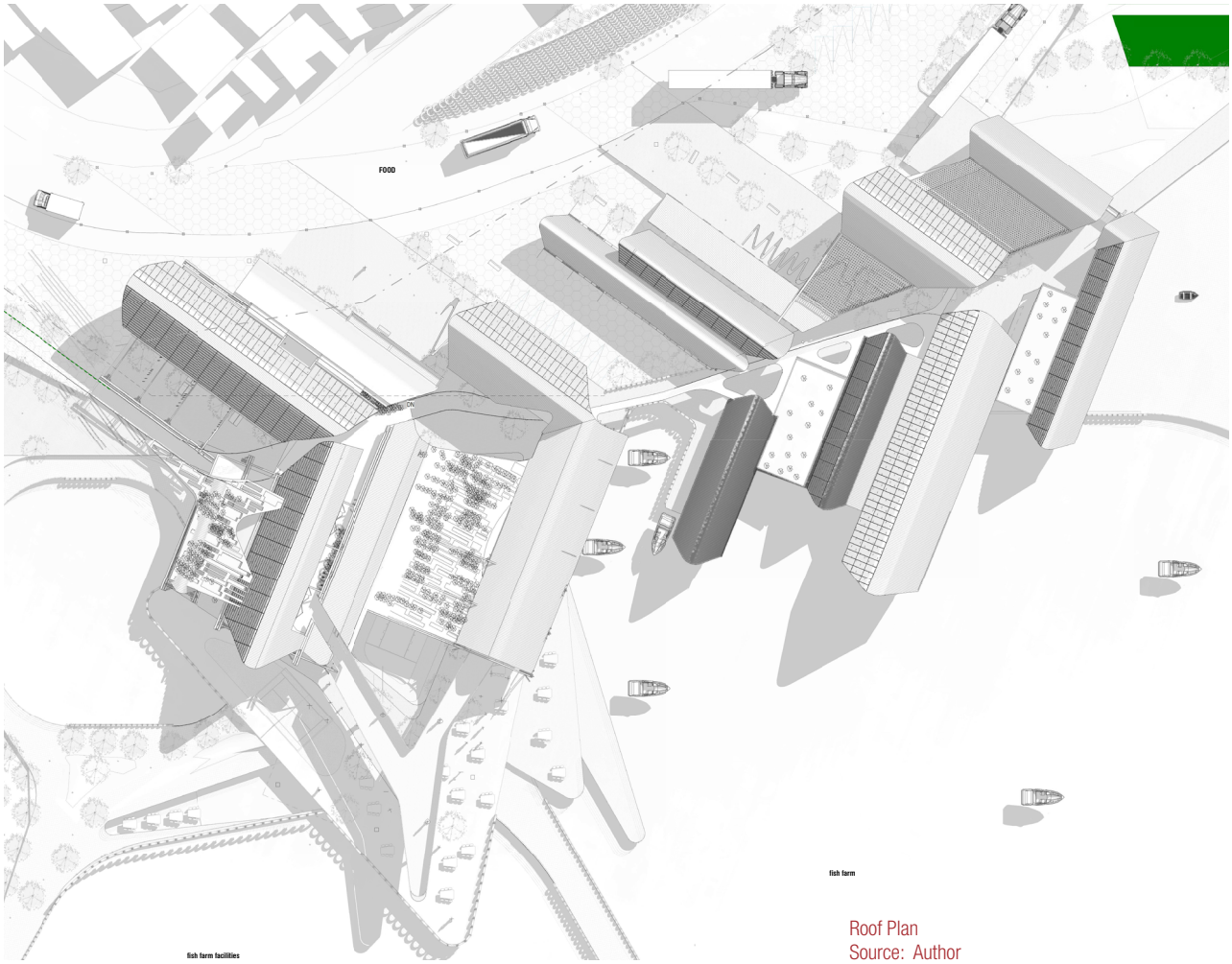
1. Design Drawings

CHAPTER 06

Anemity + Amenity
Source: Author



Ground Floor Plan
Source: Author



Roof Plan
Source: Author

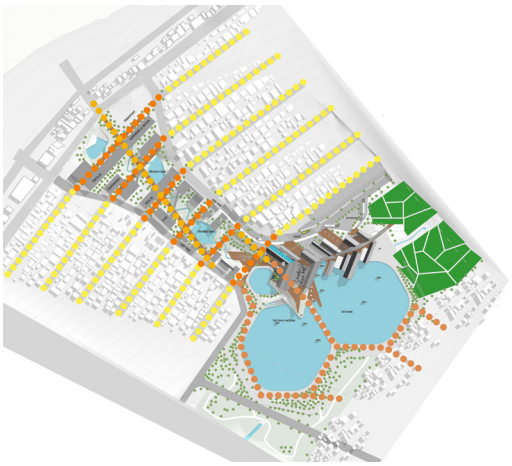
MASTER PLAN
SCALE: 1 : 500

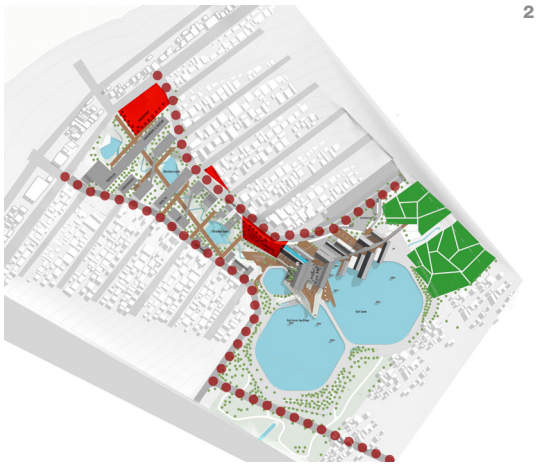
1. PEDESTRIAN CONNECTIONS ACROSS WETLAND

2. IMPROVED VEHICULAR CONNECTIVITY AND TRANSPORT NODE

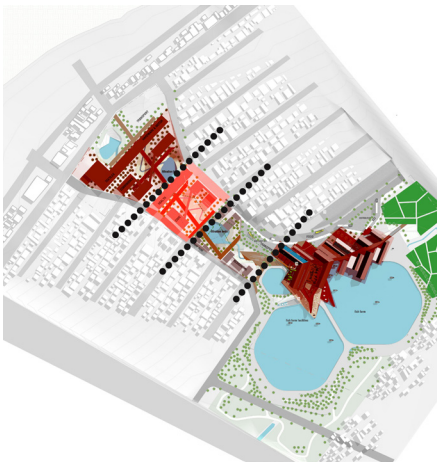
3. ECONOMIC NODE ZONING

1

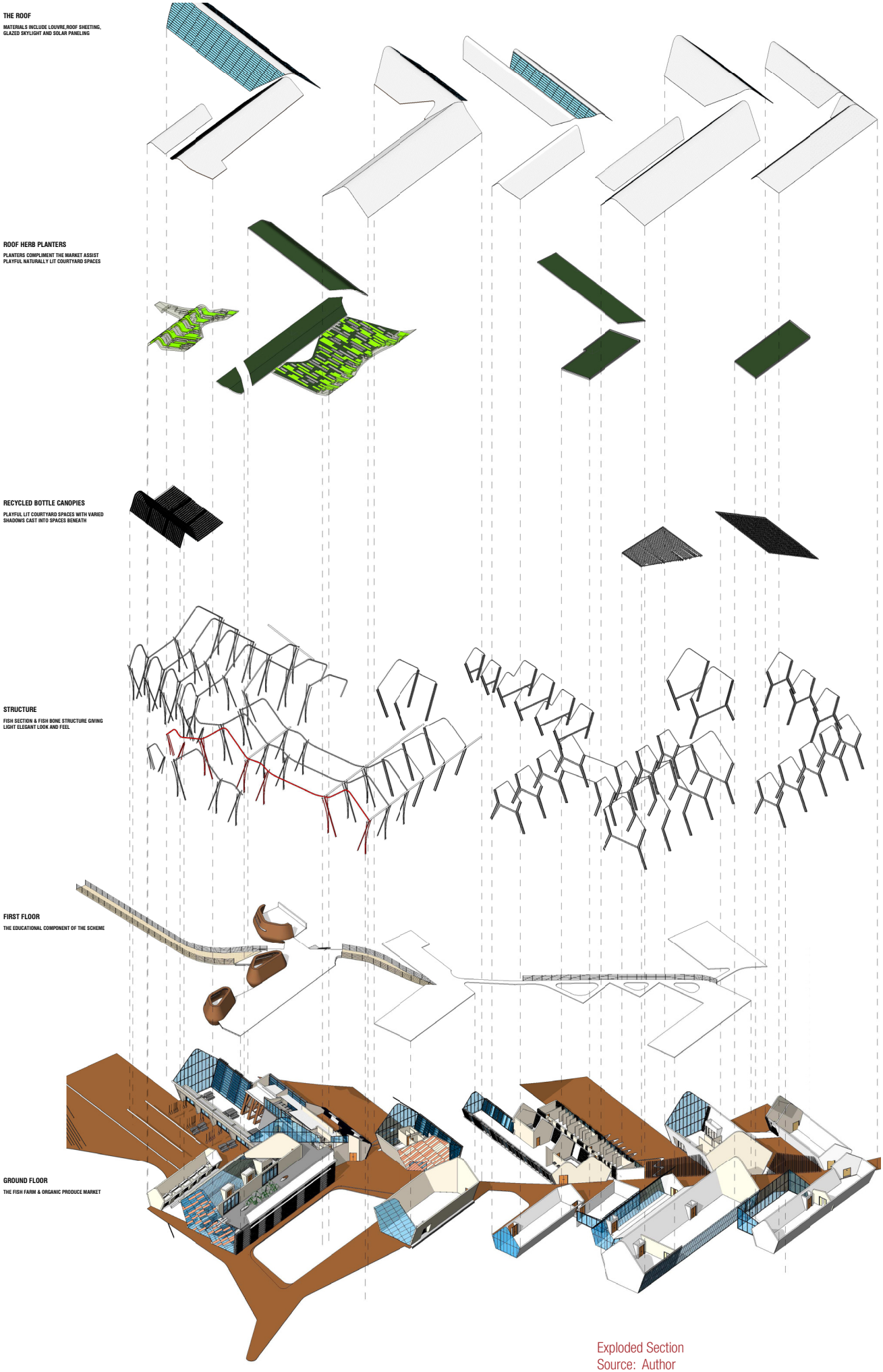




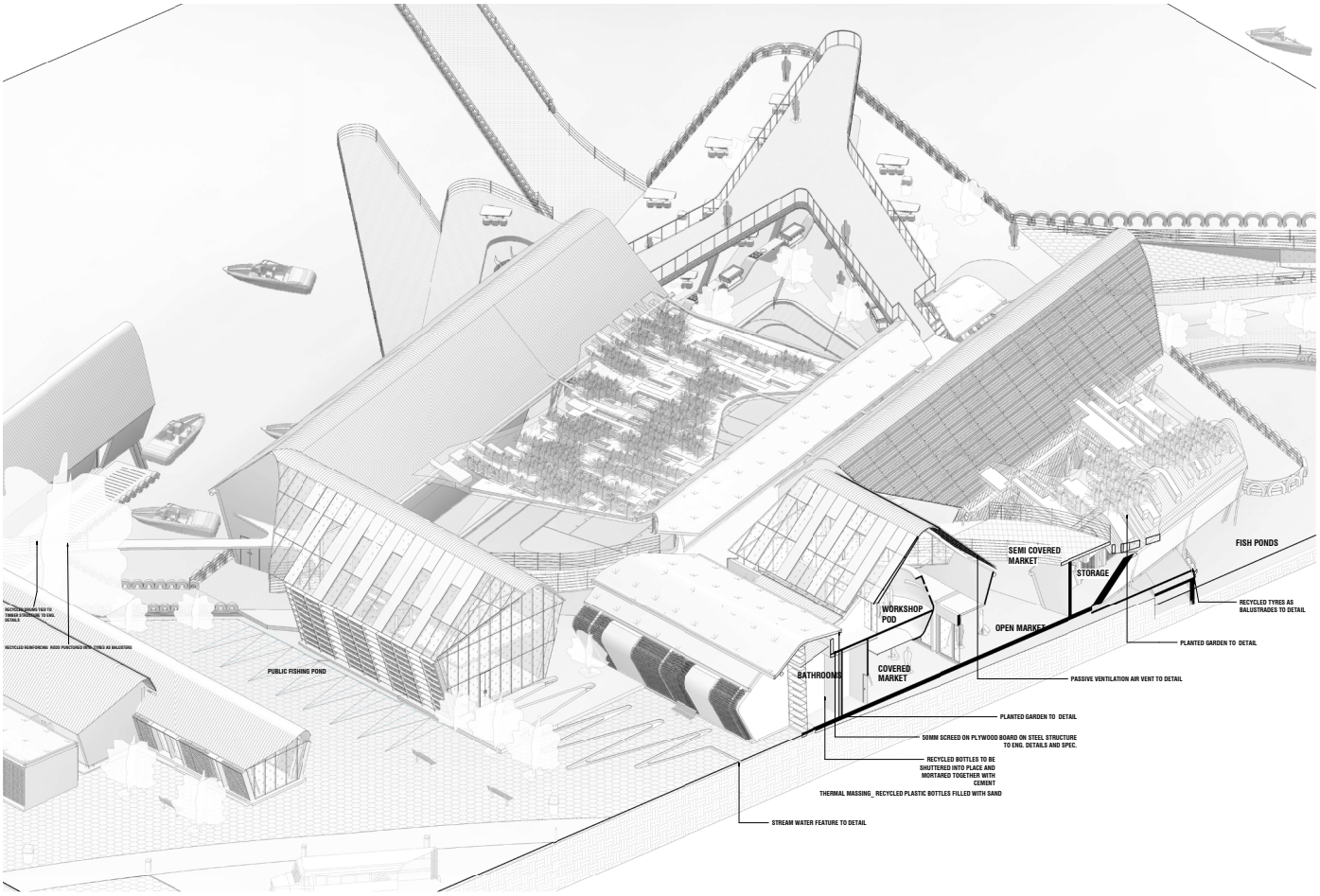
2



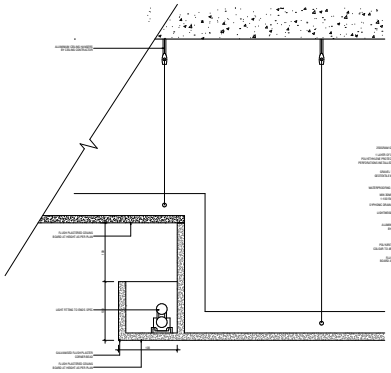
The Vibrant Economic Node
Source: Author



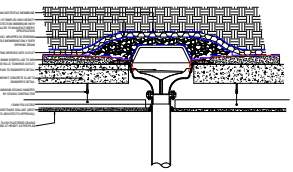
Exploded Section
Source: Author



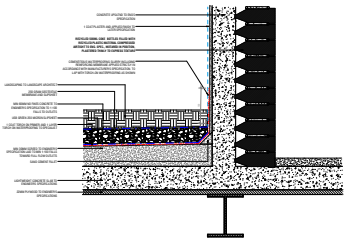
Cut Away Section
Source: Author



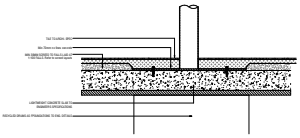
RECESSED CIELING LIGHT
SCALE: 1 : 2



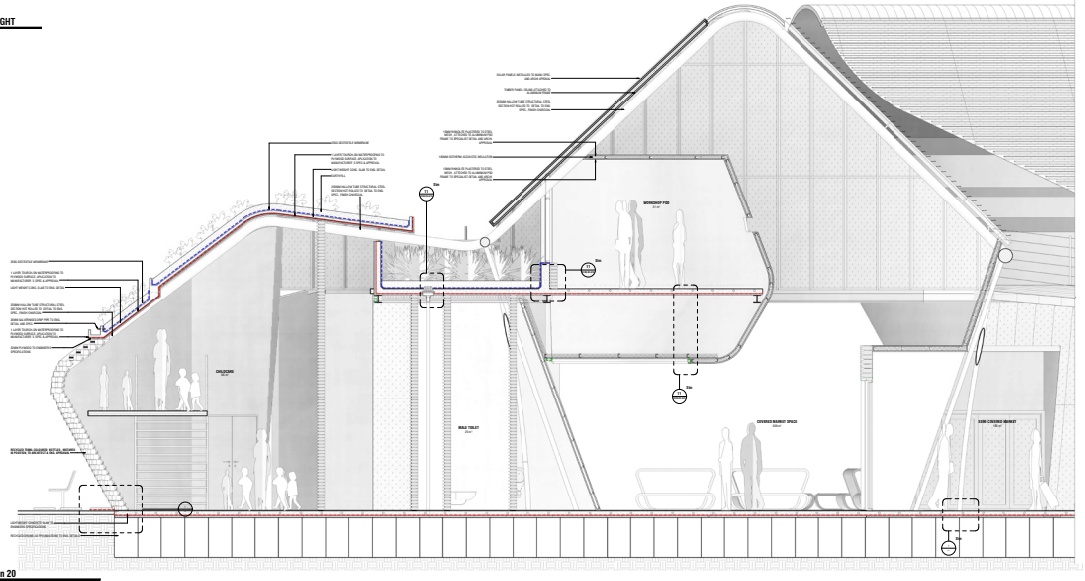
PLANTER DRAINAGE
SCALE: 1 : 5



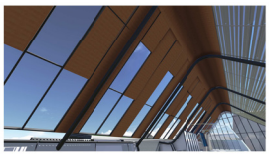
PLANTER UPSTAND
SCALE: 1 : 5

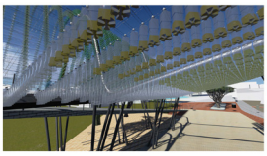


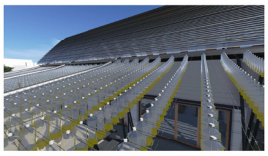
COLUMN BASE
SCALE: 1 : 5

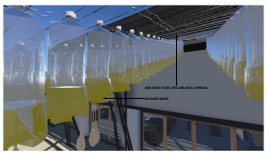


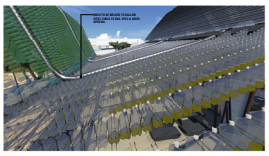
Section 20
SCALE: 1 : 25

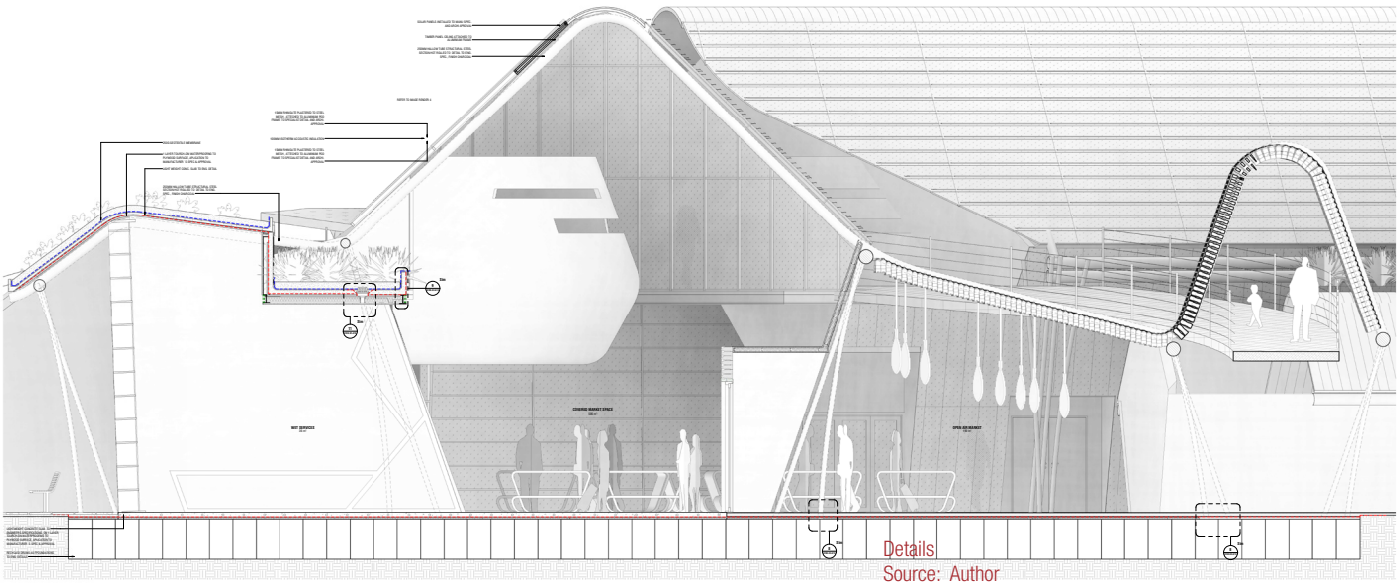












Section 1
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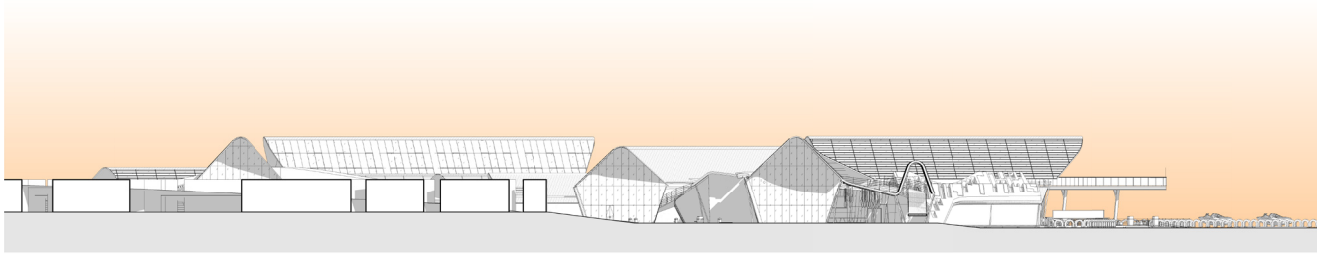
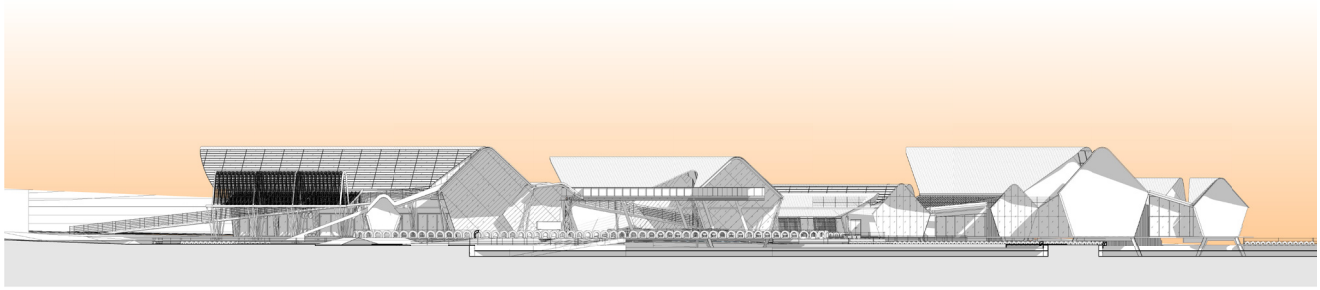
Details
Source: Author

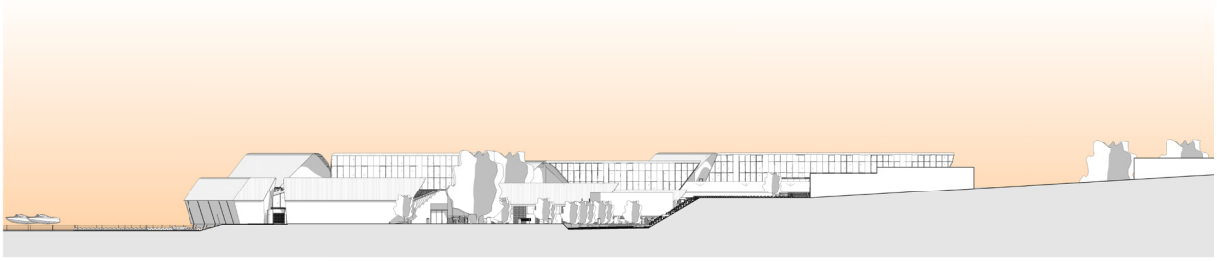


Elevation 8 - a
SCALE: 1 : 200



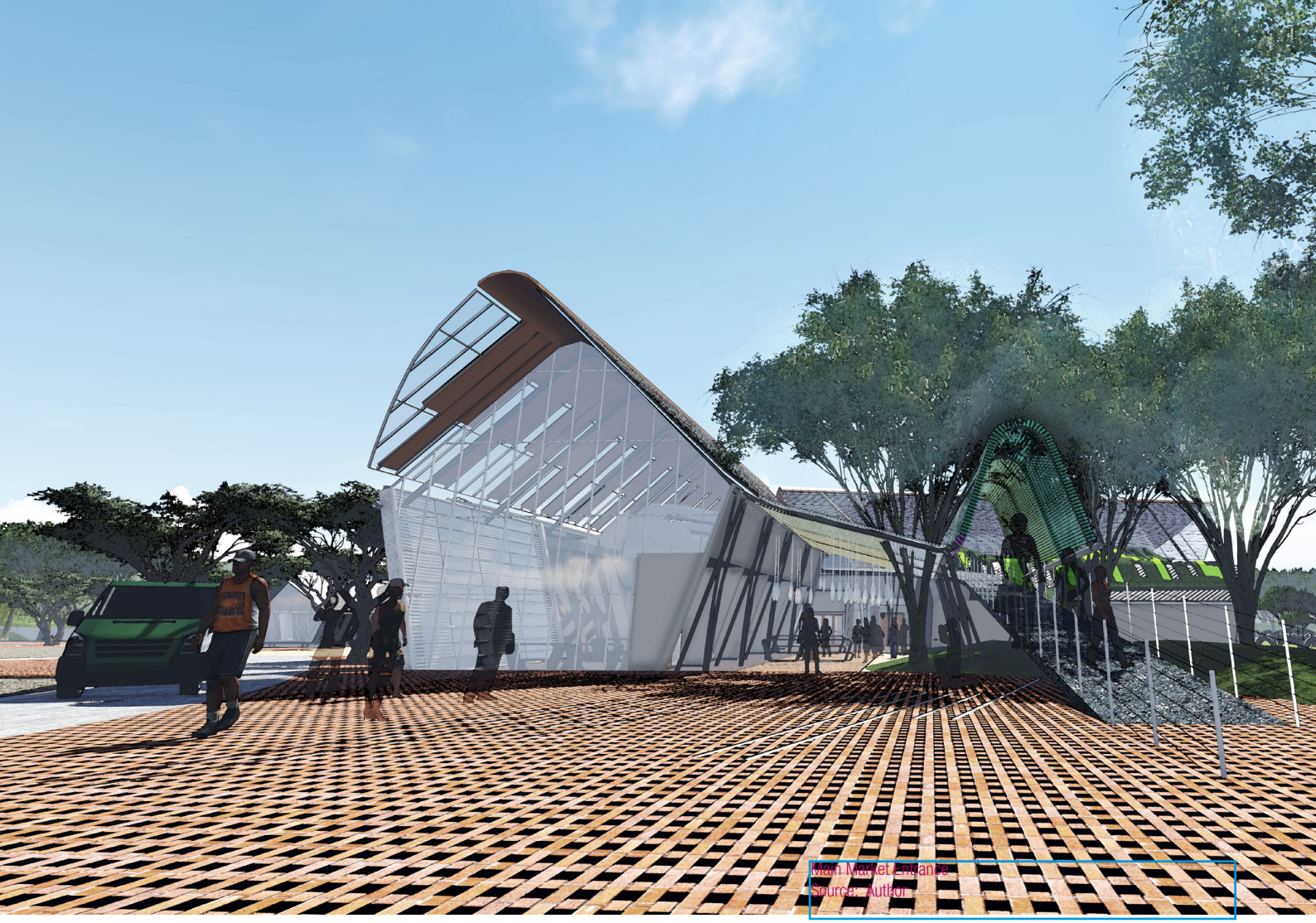
Elevation 7 - a
SCALE: 1 : 200

Section 17
SCALE: 1 : 200

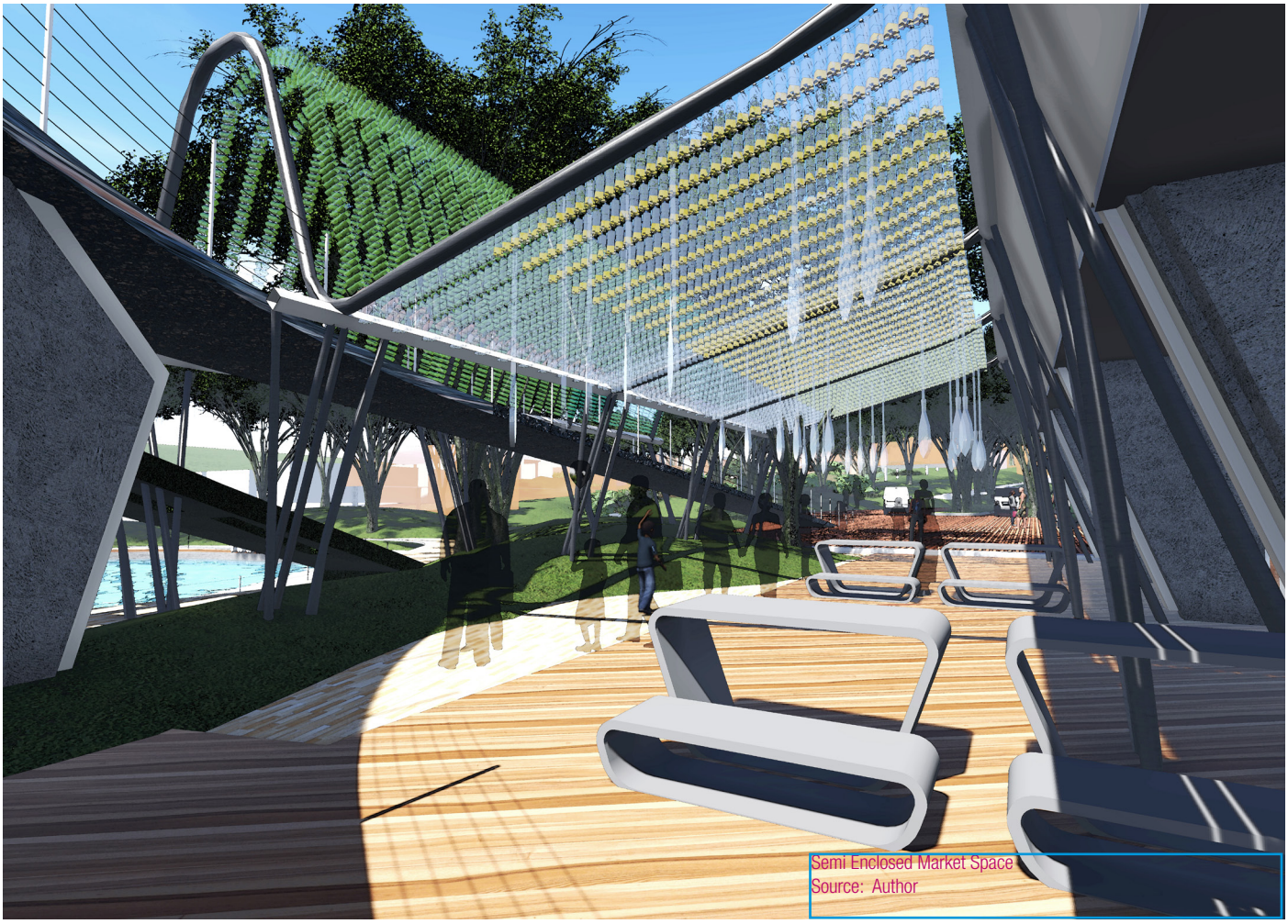


2 - b
SCALE: 1 : 250

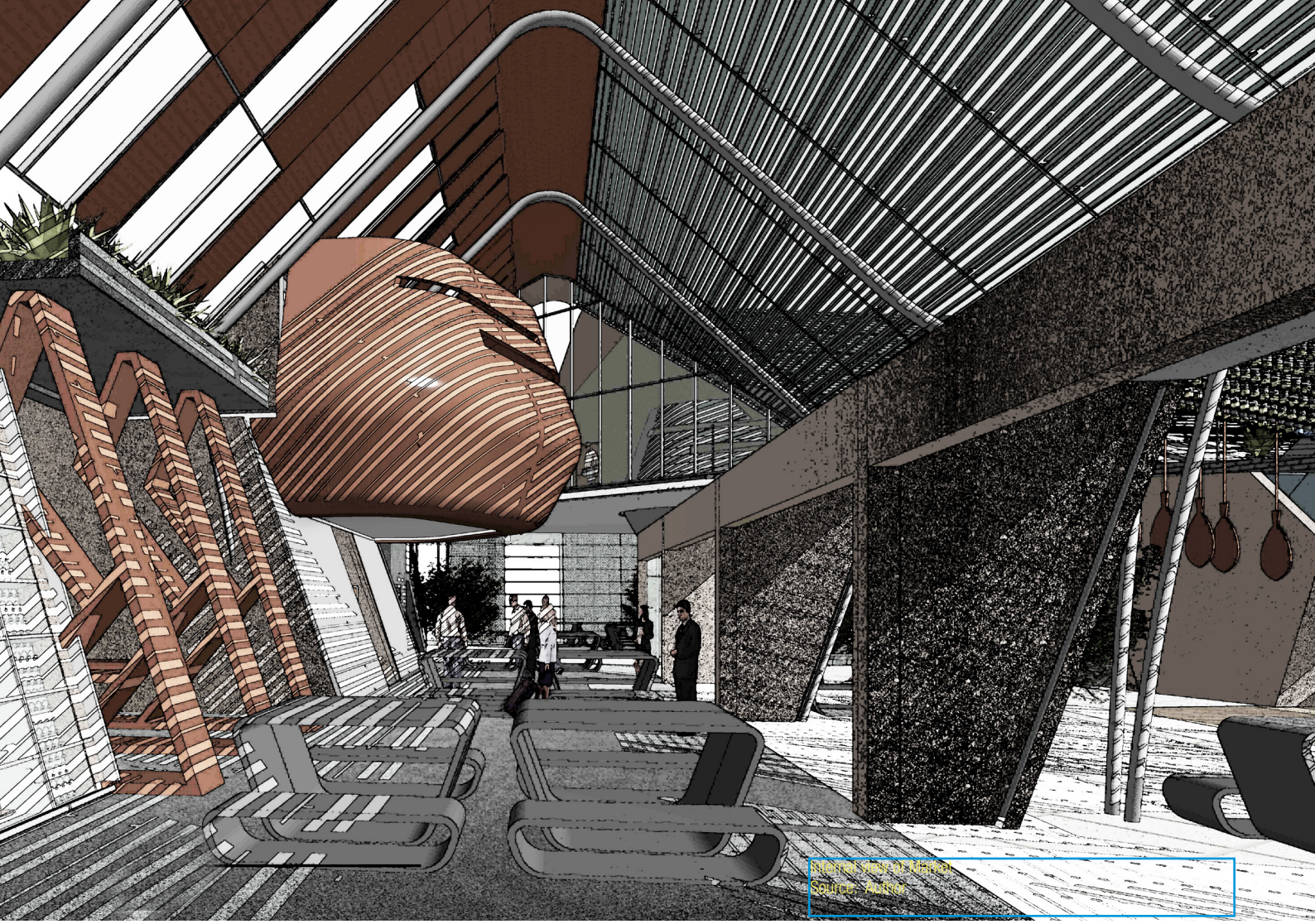
Elevations
Source: Author



Main Market Entrance
Source: Author

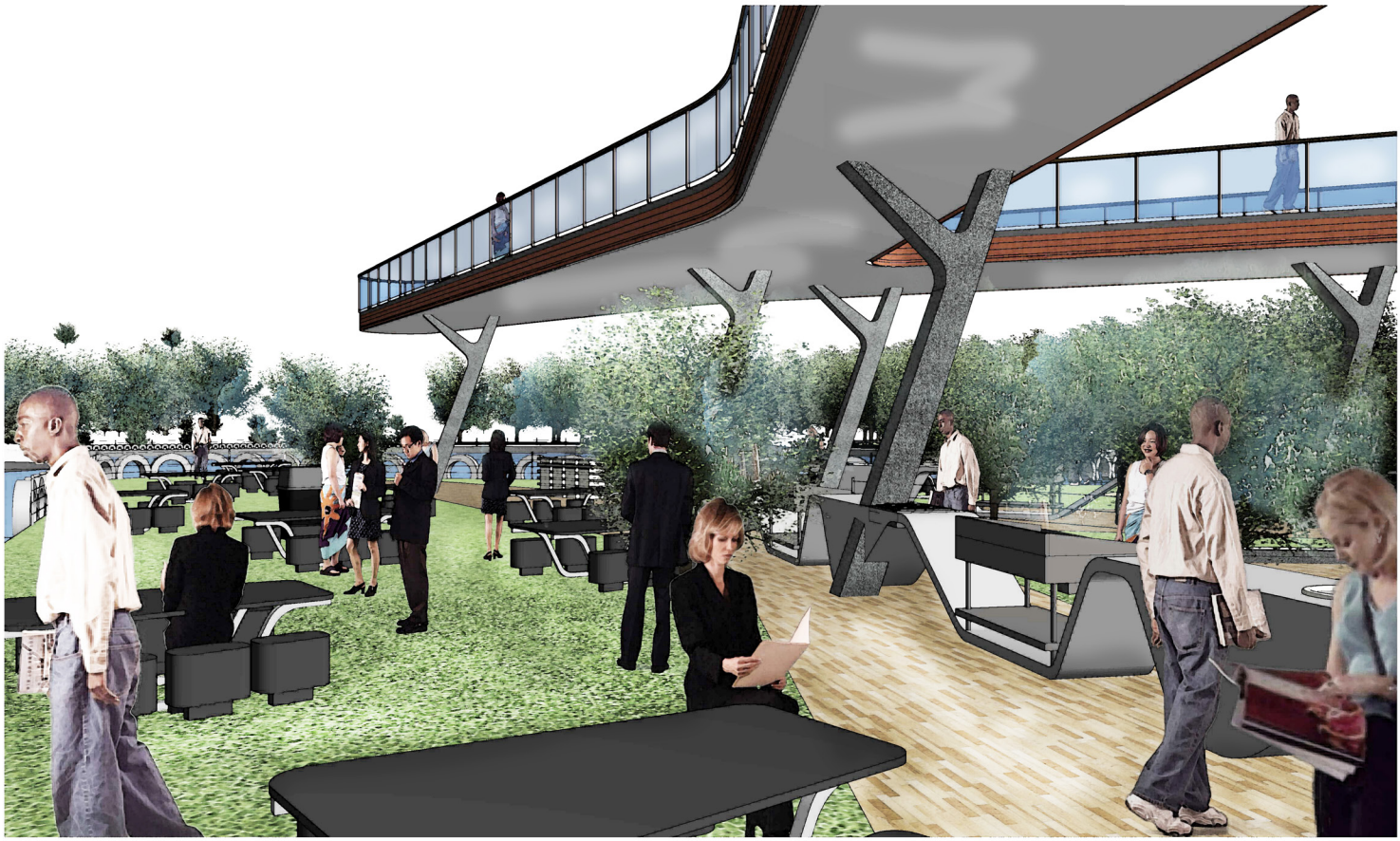


Semi Enclosed Market Space
Source: Author



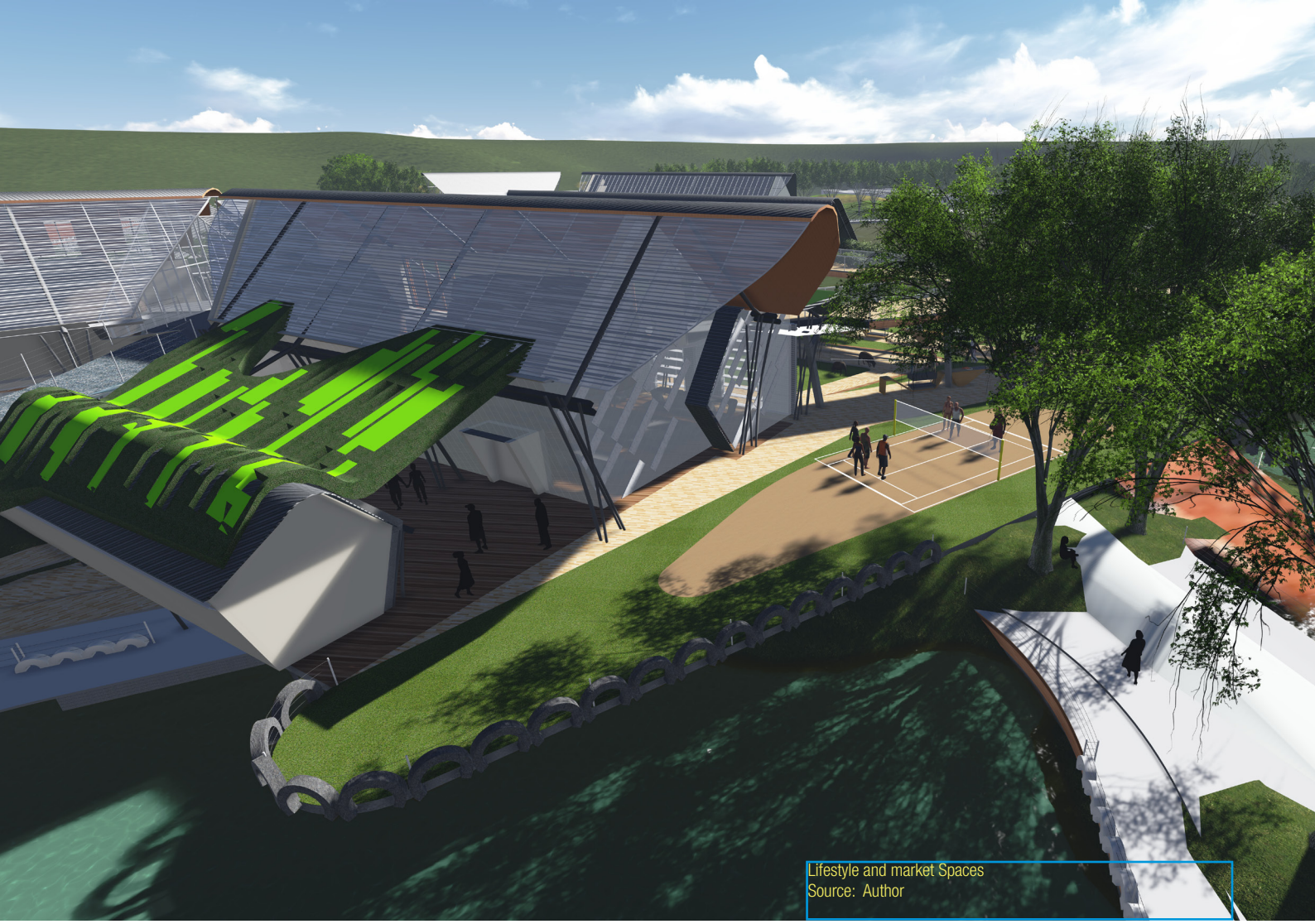
Internal view of Market
Source: Author

Enclosed Market
Source: Author

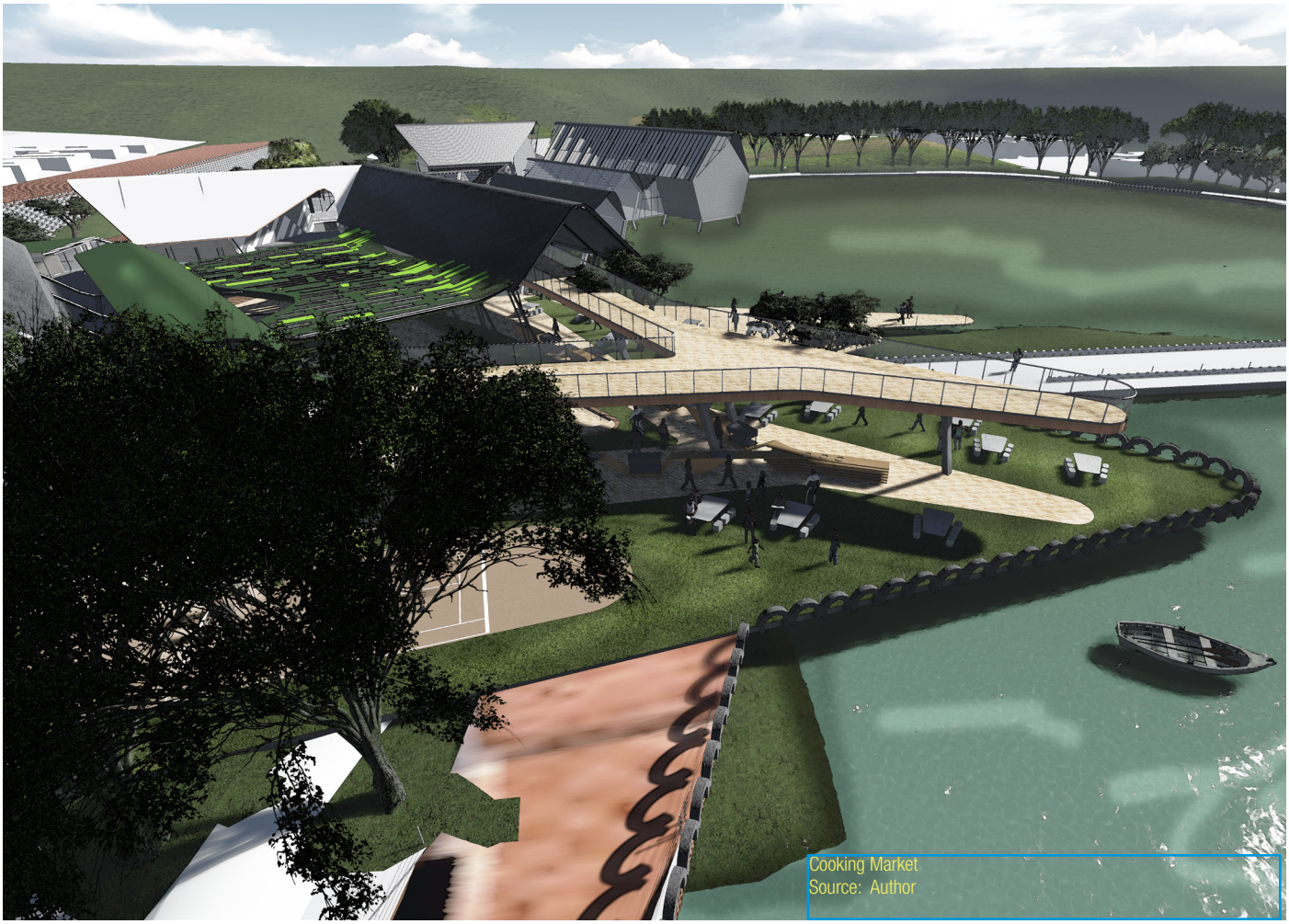


Cooking Market
Source: Author

Cooking Market
Source: Author



Lifestyle and market Spaces
Source: Author



Cooking Market
Source: Author

Fish Farm & Fresh Produce Market...Its a Lifestyle
Source: Author

References

- RMA (2007) The Use of Scrap Tires in Civil Engineering Applications. Rubber Manufacturers Association, Washington D.C. July 2007.
- Morgan P, Walker A, 1988, Retail development, Lea Coppin Publishing ltd, London
- Buck-Morss. S , 1989, The Dialectics of Seeing, Walter Benjamin and the Arcades Project, The MIT press, Cambridge
- Morrison. Kathryn A, 2004,English Shops and Shopping: An Architectural History ,Paul Mellon Centre for Studies in British Art, London
- Nicolin.P, 2014, "Urbanismo Social", Lotus International, volume 153, pp64-69
-

On line Journal s

- Authors: R DU PREEZ, EM Visser, Title: APPAREL SHOPPING BEHAVIOUR – PART 2: CONCEPTUAL THEORETICAL MODEL, MARKET SEGMENTS, PROFILES AND IMPLICATION Accessed on 30 August 2014 http://www.sajip.co.za/index.php/sajip/article/viewFile/112/108

- Author: Rolfe.R, Woodward D, Lighthelm A, Guimaraes P, Title: THE VIABILITY OF INFORMAL MICRO-ENTERPRISE IN SOUTH AFRICA, Accessed on 30 August 2014 http://whitman.syr.edu/programs-and-academics/centers-and-institutes/abp/conference/papers/The%20Viability%20of%20Informal%20Micro-Enterprise%20in%20South%20Africa.pdf
- en.wikipedia.org/wiki/Gross_value_added
- DTI in aquaculture http://www.southafrica.info/business/investing/incentives/aquaculture-020413.htm#.VBgTQxagSt8
- Stormwater Wetland design in Urban settings, http://www.bae.ncsu.edu/stormwater/PublicationFiles/SWwetlands2000.pdfAccecced 18 Sep. 14
- Diepsloot Flood, http://dailysun.mobi/news/read/4393/rain-chaos Accessed 18 Sep. 14
- Nitrate, http://www.beslter.org/virtual_tour/Nitrate.html Accessed on 19 Sep. 14
- Aquaponics, https://attra.ncat.org/attra-pub/download.php?id=56 Accessed on 19 Sep. 14
- CaseStudy Ter Morshuizen, http://www.farmersweekly.co.za/article.aspx?id=46146&h=The-commercial-viability-of-aquaponics Accessed on 20 Sep. 14
- Aquaponics in Kenya, http://www.amshaafrica.org/projects-and-clients/current-projects/aquaponics-in-rural-kenya.html Accessed on 20 Sep. 14
- Ohio Aquaponics, http://ohioaquaculture.org/pdf/2013Workshop/AquaponicsBarryAdler.pdf Accessed on 20 Sep. 14
- Fish pond thermal control, http://www.asi.co.za/cul_fishfarm.html Acessed 21 Sep. 14
- Recycled bottles, http://www.archdaily.com/71382/floating-dinning-room-goodweather-design-loki-ocean/ Accessed on 22 Sep. 14
- Bottle Brick, http://allafrica.com/stories/201303190169.html accessed on 23 Sep. 14
- Reaserch Brick bottle, www.researchgate.net/...bottle...bricks/.../02e7e5357f926d157f000000?...) Accessed on 23 Sep. 14
- Floating dining, http://www.archdaily.com/71382/floating-dinning-room-goodweather-design-loki-ocean/ accessed on 28 Sep. 14
- Anaerobic Digesters, http://www.sswm.info/category/implementation-tools/wastewater-treatment/hardware/site-storage-and-treatments/anaerobic-di Accessed 24 Sep. 14
- Makoko, http://www.architectural-review.com/essays/makoko-floating-school-by-nle-architects-lagos/8655821.article Accessed 28 Sep. 14
- Tyres, http://www.bdlive.co.za/business/industrials/2014/08/18/tyre-recycling-sets-off-on-road-to-environmental-sustainability accessed on 28 Sep. 14
- Tyres Research , http://www.ejge.com/2008/Ppr0825/Ppr0825.pdf accessed on 28 Sep. 14
- Sustainable Sytems, http://www.sustainablesystems.co.za/?page_id=17 accessed on 29 Sep. 14
- The Spaza shop, http://www.spazanews.co.za/ Accessed on 06 Oct. 14
- Xenophobia, http://www.dailymaverick.co.za/article/2013-05-28-analysis-the-ugly-truth-behind-sas-xenophobic-violence/#.VDchQhaAP_Y Accessed on 10 Oct. 14

Images

Pet Aquaponics, http://community.theaquaponicsource.com/m/group?id=4778851:Group:2308 Accessed on 20 Sep. 14
- Fish pond thermal control, http://www.asi.co.za/cul_fishfarm.html Acessed 21 Sep. 14
- In slab heating, http://greengaragedetroit.com/images/3/37/Geo-Solar_FINAL.png Accessed on 21 Sep. 14
- Plastic bottle column, http://humansarefree.com/2013/12/genius-how-to-end-homelessness-in-one.html Accessed on 23 Sep. 14
- Plastic bottle finish, http://nigerianarchitecture.blogspot.com/2011/09/bottle-house.html Accessed on 23 Sep. 14
- Finishes, http://www.instructables.com/id/New-Innovation-in-Construction-using-Waste-Plastic/ Accessed on 23 Sep. 14
- Penda Bottles, http://ad009cdnb.archdaily.net/wp-content/uploads/2013/06/51ca7881b3fc4b571e0000a4_-the-cola-bow-

installation-penda_bottles_ph_05.jpg Accessed on 23 Sep. 14
- Reaserch Brick bottle, www.researchgate.net/...bottle...bricks/.../02e7e5357f926d157f000000?...) Accessed on 23 Sep. 14
- Floating dining, http://www.archdaily.com/71382/floating-dinning-room-goodweather-design-loki-ocean/ accessed on 28 Sep. 14
- Tyres House http://en.wikipedia.org/wiki/Earthship#mediaviewer/File:Unfinished_Earthship.JPG accessed on 28 Sep. 14

Technical Report

- Demacon (2012) ,Diepsloot Economic Activity Analysis-Executive Report, Johannesburg, Demacon Market Studies
- JDA (2012), Diepsloot Urban Development Framework-Street Activity, Johsnnesburg, JDA
- MLC(2009), Kagiso Viability Sch 3 Rev 8, Johannesburg, MLC Quantity Surveyors
- KMH(2009), Kagiso Development Shopping Center, Johannesburg, KMH Architects